FINAL

ENVIRONMENTAL ASSESSMENT FOR ARMED MUNITIONS INTEGRATION TESTING ON THE PRECISION IMPACT RANGE AREA

May 2005

95th Air Base Wing
Civil Engineer Directorate
Environmental Management Division
Edwards Air Force Base, California

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FINDING OF NO SIGNIFICANT IMPACT FOR ARMED MUNITIONS INTEGRATION TESTING ON THE PRECISION IMPACT RANGE AREA

1.0 INTRODUCTION

The U.S. Air Force proposes to designate an armed munition only target at PB-13 site on Edwards AFB, California. The site is located within the West Range of the Precision Impact Range Area (PIRA) and is entirely within the R-2515 restricted area. The Proposed Action is being developed to support the integration testing of armed munitions on aircraft and other delivery platforms which is considered one of the primary functions of the Air Force Flight Test Center, Edwards AFB, California.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES CONSIDERED

The proposed action to conduct up to 100 armed munition weapons delivery events per year was selected as Alternative A. Munitions could be delivered in single or multiple quantities, depending on the approved test plan. Individual armed munitions would be limited to 500 pounds of net explosive weight. The PB-13 target would be cleared after each event by Explosive Ordnance Disposal personnel and before subsequent test missions were initiated. Alternative B would limit the number of events to 50 events per year, and Alternative C would limit the number of events to 10 per year. The No-Action Alternative was also analyzed, in which an armed munition only target would not be established; however routine use of the target for previously approved missions would continue to occur.

3.0 ENVIRONMENTAL CONSEQUENCES

The Region of Influence (ROI) of the proposed project consists primarily of Edwards AFB and the PB-13 target area. The ROI for each alternative is discussed in terms of two distinct regions: (1) on-base region and (2) PIRA, PB-13 target. The on-base region includes all of Edwards AFB. PIRA, PB-13 target includes the 1,000 foot diameter area located at 34 degrees 51.30 minutes North Latitude and 117 degrees 44.17 minutes West Longitude. Airspace and noise issues were reviewed for off-base areas adjacent to Edwards AFB and the PB-13 target.

Resources within the ROI have been identified and evaluated under the following categories: air quality, airspace, cultural resources, environmental justice, geology and soils, hazardous waste/hazardous materials, infrastructure, land use, natural resources, noise, public/emergency services, safety, socioeconomics, and water resources. No potentially significant impacts were identified to any of these areas under the alternatives considered. This finding was based primarily on the fact that:

- The limited number of flights (100 or less per year) would be less than 2 percent of the current activity.
- The noise generated from the detonations of the armed munitions on the PB-13 target would be similar in peak sound levels to the noise from the sonic booms created by the supersonic aircraft.
- After each mission the target area would be cleared of any unexploded ordnance, thus reducing the potential for contamination of any of the resource areas to less than significant.

Decisions regarding the significance of impacts, as defined under National Environmental Policy Act of 1969 (NEPA), are based on a consensus of the interpretation of environmental laws, rules, and regulations by cognizant federal, state, and local agencies; previously certified environmental documentation for similar projects; and trained and experienced professionals in each environmental field.

Cumulative Impacts

Alternatives A, B, or C would have no cumulative impacts to airspace, land use, noise, or to any other issue area analyzed in this Environmental Assessment (EA). To prevent the accumulation of unexploded ordnance at the PB-13 target, the Air Force will establish a procedure to remove fragments and detonate in place any unexploded ordnance before any subsequent mission.

Short-term Versus Long-term Productivity of the Environment

No new construction or other development would be required under the Armed Munitions Integration Testing Program and current Air Force or contractor personnel from other bases would be used for the program. Neither Alternative A, B, nor C would involve any short- or long-term changes in population or productivity of the environment.

Irreversible and Irretrievable Commitments of Resources

This EA only addresses the use and maintenance of the PB-13 target for armed munitions. Designating the site for armed munitions or integration testing would not require an irreversible or irretrievable commitment of resources. Irreversible or irretrievable commitment of resources that would be involved in other phases of the program (e.g., munition fabrication and transportation to the site) would be addressed in separate environmental documentation. Implementation of Alternative D (No-Action Alternative) would also not require an irreversible or irretrievable commitment of resources.

4.0 CONCLUSION

On the basis of the findings of the EA, no significant impact to human environment would be expected from implementation of the Proposed Action. No mitigation measures are recommended. Therefore, issuance of a Finding of No Significant Impact is warranted, and preparation of an Environmental Impact Statement, pursuant to the NEPA (Public Law 91-190) is not required. Background information that supports the research and development of this FONSI and the EA are on file at Edwards AFB and may be obtained by contacting:

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9 May 05
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EXECUTIVE SUMMARY

This Environmental Assessment (EA) has been prepared to analyze the environmental consequences associated with designating the PB-13 target area in the Precision Impact Range Area (PIRA) at Edwards Air Force Base as an armed munitions only target. Designating and using PB-13 in this capacity would primarily support testing and integration of weapons systems with various new and current aircraft platforms, which is an integral part of the Air Force Flight Test Center (AFFTC) mission. In addition to satisfying the requirements of the National Environmental Policy Act of 1969, this document provides the basis for safeguarding the resources under the protection of the AFFTC that could potentially be affected by the proposed action.

This EA includes four alternatives: Alternative A—Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action); Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year; Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year; and Alternative D—No-Action Alternative.

The impact of each alternative on 14 resource areas that could potentially be affected was evaluated. The resource areas considered are air quality, airspace, cultural resources, environmental justice and the protection of children, geology and soils, hazardous waste/hazardous materials/solid waste, infrastructure, land use, natural resources, noise and vibration, public/emergency services, safety, socioeconomics, and water resources.

The analysis indicated that none of the impacts would be significant. Measures to protect the various resource areas have been incorporated into the description of each action alternative, and mitigation measures have been included to further address any potential effects on the environment.

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1.0 PURPOSE AND NEED

1.1 INTRODUCTION

This Environmental Assessment (EA) evaluates the potential environmental effects associated with the proposed use of one target on the Precision Impact Range Area (PIRA) at Edwards Air Force Base (AFB) for testing and evaluation (T&E) of armed munitions integration and delivery.

This EA was prepared in accordance with all applicable federal, state, local laws and regulations including the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321 *et seq*.); the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1500–1508); and 32 CFR Part 989, *The Environmental Impact Analysis Process*. The U.S. Air Force Flight Test Center (AFFTC) is representing the Department of Defense (DoD) as the lead agency.

1.2 LOCATION OF PROPOSED ACTION

Edwards AFB is located in the Antelope Valley region of the western Mojave Desert in Southern California. It is about 60 miles northeast of Los Angeles, California. The base occupies an area of approximately 301,000 acres or 470 square miles. Portions of the base lie within Kern, Los Angeles, and San Bernardino counties (Figure 1-1).

The PIRA is located on the southeastern one-third of Edwards AFB, a portion of which borders the Air Force Research Laboratory. The PIRA occupies approximately 92,160 acres (144 square miles). The site of the Proposed Action, target PB-13 (Figure 1-2), is located in the West Range of the PIRA (Figure 1-3).

1.3 BACKGROUND

The use of Edwards AFB as a bombing and gunnery range began when Lt Col H.H. “Hap” Arnold established a stark and remote training site (Muroc Bombing and Gunnery Range) for his March Field, California, squadrons in September of 1933. It operated in that capacity until 1942 when it was activated as a major bomber-training base for training World War II pilots before they deployed overseas.

Munitions integration testing would include the use of inert munitions (munitions missing operational components and/or containing spotter rounds) or fully operational weapons systems containing an armed

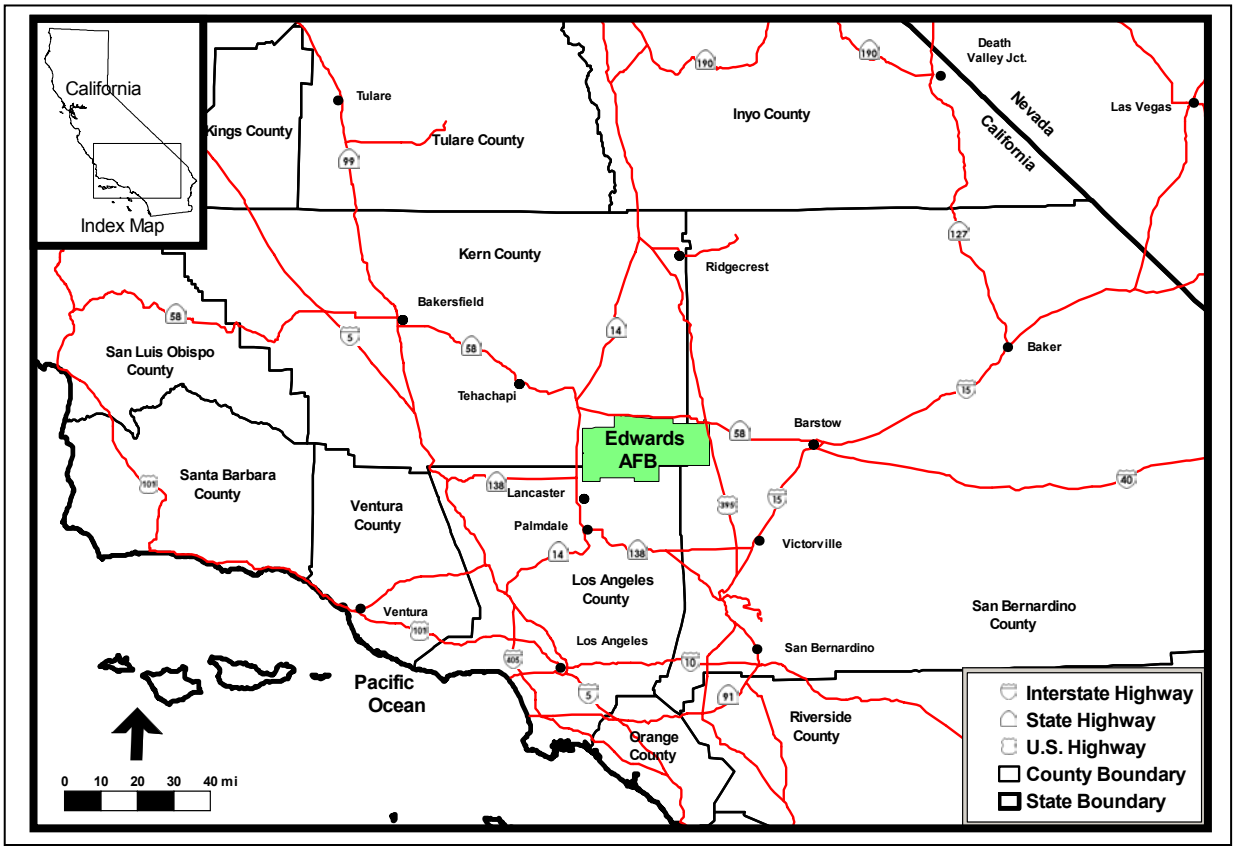
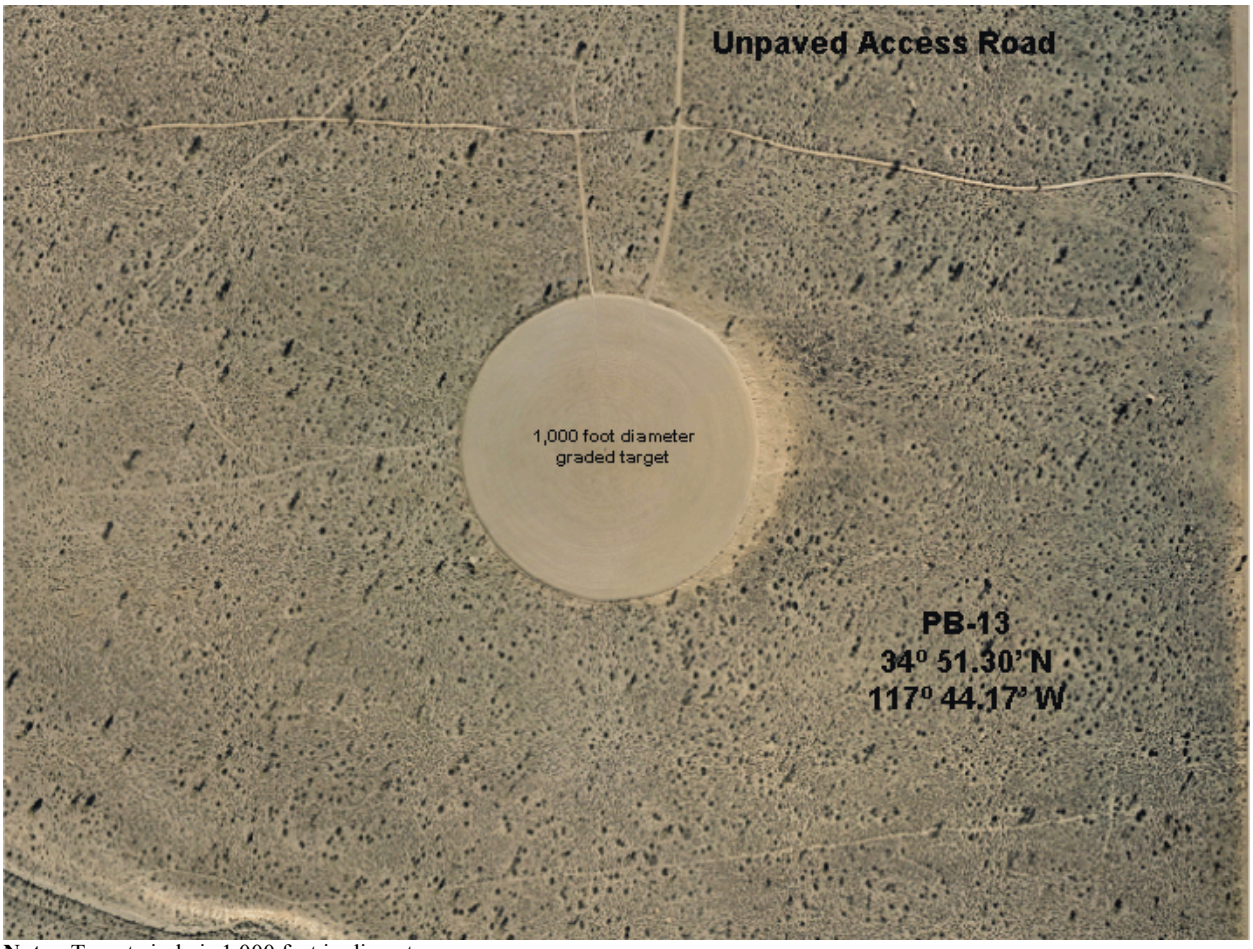


Figure 1-1 Edwards AFB and Vicinity

munition—a fully operational munition containing all components and the full net explosive weight (NEW). Dropping armed munitions—bombs with NEW designed to detonate on impact—on the various targets was an integral part of the base's new mission. In 1995 the U.S. Fish and Wildlife Service (USFWS) issued a biological opinion allowing AFFTC/Edwards AFB to conduct ten 5,000-pound, ten 1,000-pound, and twenty 250-pound detonation tests annually at various locations at the Phillips Lab (Air Force Research Lab [AFRL]).

The AFFTC was officially activated at Edwards AFB on June 25, 1951. The AFFTC is tasked to support the Air Force Materiel Command (AFMC) mission by conducting and supporting research, development, T&E of both manned and unmanned aerospace systems, and the operation of the Air Force Test Pilot School. This mission not only involves all aspects of testing aerospace systems, but also includes the flight evaluation and recovery of research vehicles and developmental testing of aerodynamic decelerators. As part of its mission, the AFFTC conducts T&E programs for the Air Force in addition to supporting other T&E customers including the U.S. Army and U.S. Navy, other U.S. government agencies, private contractors, and foreign governments.



Note: Target circle is 1,000 feet in diameter.

Figure 1-2 Aerial Photo of PB-13

However, the majority of the AFFTC's workload consists of testing total weapon systems, including all major subsystems, as part of the AFMC systems development and support. This includes the complete new weapons systems testing (as with the B-2, C-17, and F-22 programs). Additionally, this extends to testing of major modifications to existing systems, such as the F-16 Block 50 upgrade, and subsystem upgrades such as integration of weapons on the Predator unmanned aerial vehicle (UAV). Each subsystem is evaluated to determine whether it will perform as designed, whether it will perform its function in conjunction with other subsystems in a mission environment, and its effects on the total system performance. One of the most critical phases of T&E is weapons delivery, which is considered an integral part of the mission of the AFFTC.

One of the major AFFTC resources is the Edwards Flight Test Range (EFTR). The EFTR consists of multi-environmental test areas, instrumentation, and airborne capability needed for developmental and operational T&E. Low and high altitude supersonic flight profiles can be accommodated over land from

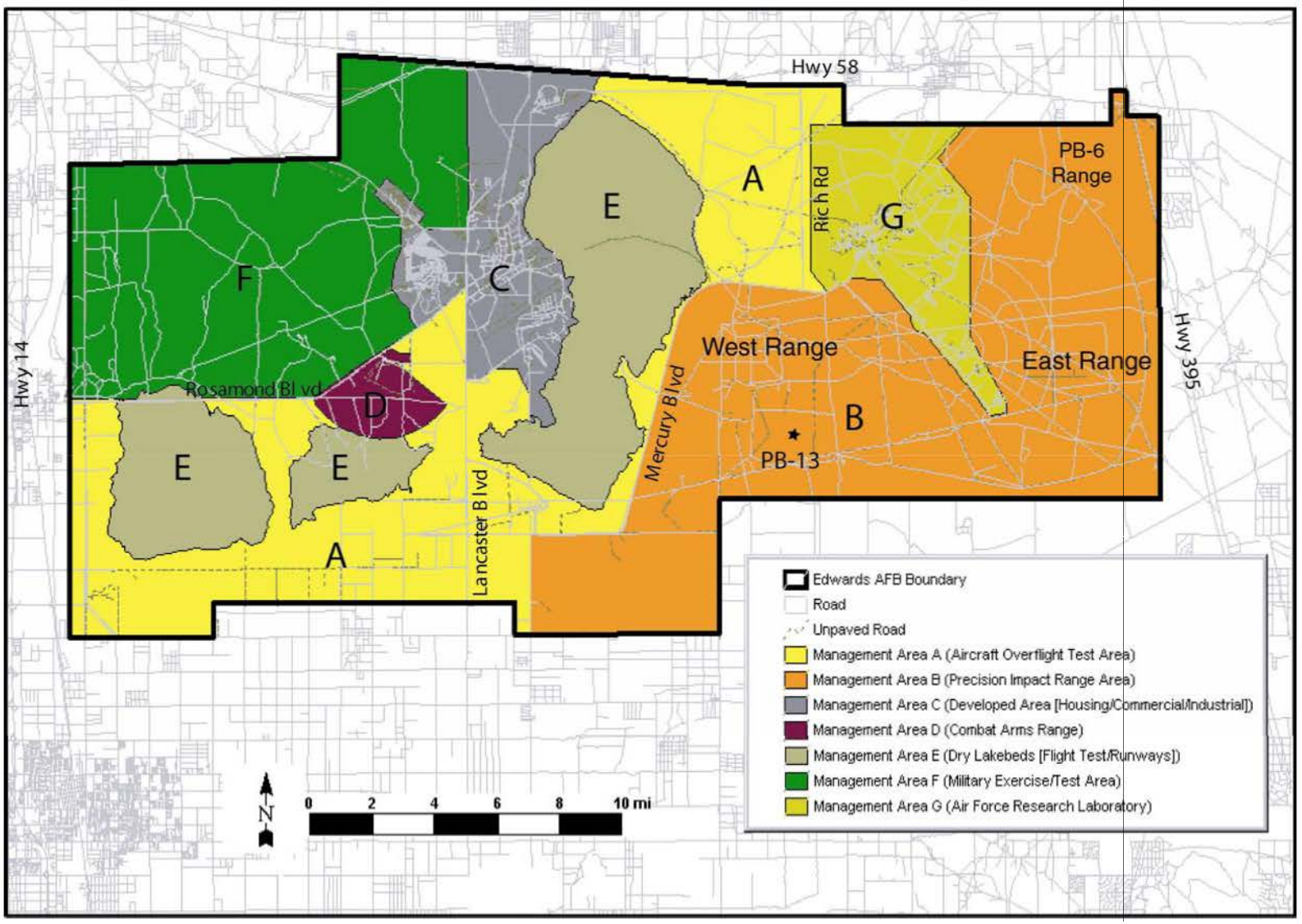


Figure 1-3 Location of PB-13 on the West Range of the PIRA

the surface to unlimited altitudes. The extended range encompasses an instrumented airspace corridor extending from San Nicolas Island in the Pacific Ocean to the Utah Test and Training Range at Hill AFB, Utah. Highly instrumented land test areas, along with access to over-ocean areas, provide the Air Force with a fully capable aircraft/avionics/weapons integration and subsystem–testing environment. The PIRA is one component of the EFTR.

Mission facilities for the PIRA include instrumentation radars, optical trackers, telemetry receivers, video and timing instrumentation, infrared (IR) resolution ranges, targets, and reflector arrays. These elements are controlled from Ridley Mission Control Center (RMCC) and can be modified and adjusted to meet mission T&E requirements. The focus of RMCC activities is on real-time collection and display of flight test information, but pretest planning and preparation and post-mission data processing and analysis are also performed. The Range Division operates the PIRA and associated facilities at Edwards AFB and is overseen by the 412th Test Wing (412 TW) and AFFTC Commander.

The Proposed Action would occur within the boundaries of the PIRA's West Range. The scope of the impact analysis performed in this EA is, therefore, limited to armed munitions delivery on the PIRA, specifically to target PB-13. Historically, armed munitions tested at Edwards AFB supported a variety of delivery platforms. No relocation of PIRA facilities or new construction is envisioned as a result of this Proposed Action.

1.4 PURPOSE OF PROPOSED ACTION

The Proposed Action is to designate target PB-13, located on the PIRA's West Range, as an armed munitions–only target. The objectives of establishing an armed munitions target at Edwards AFB are the following:

- Support ongoing and future systems integration testing and armed munitions delivery;
- Support T&E of an armed munitions delivery mission that is independent of the platform delivering the munition; and
- Complement Edwards AFB and the AFFTC current mission capabilities and facilitate the completion of life-cycle testing of an integrated, armed munitions delivery system.

1.5 NEED FOR PROPOSED ACTION

Armed munitions delivery system testing at Edwards AFB is restricted to the use of inert munitions. New armed munition systems are not always available with inert munitions with which to conduct testing. Additionally, the test objectives for the final stage of integration testing may require armed munitions. Current restrictions on the PIRA prevent the use of armed munitions during aircraft system testing. Therefore, the final stage of system integration testing for systems lacking inert munitions must be relocated to an area where armed munitions testing can be performed.

Relocating the munitions delivery testing program can result in unnecessary re-testing of armed munitions delivery subsystems, which could be required to ensure test parameters are calibrated and qualified at the new test site. The associated increased cost and time required to relocate the testing program could delay the operational use of an armed munition needed to counter real-world tactical threats.

For example, a recent munitions-integration test consisting of firing a Hellfire air-to-ground missile from a Predator UAV could not be conducted on the Edwards AFB range despite the clear advantages to the test program of doing so because the Edwards AFB range is not certified for use of the armed munitions required for the test. The Predator UAV was flown from the General Atomics facility at Mirage Dry Lake, located approximately 20 miles southeast of the Edwards AFB test ranges. The test could have been completed at the company facility with a short flight to the Edwards AFB range for actual missile firing. However an inert Hellfire missile was not available, which meant an armed munition had to be used for the test. Because Edwards AFB is not certified for use of armed munitions, the test program was forced to use the Naval Air Station China Lake range, which is over 80 miles away. This required a complete deployment of the aircraft, ground support personnel, and all test equipment to Naval Air Station China Lake because the distance to the range and other operational considerations precluded flying from the General Atomics facility. The test was in support of a real-time requirement for an anti-terrorism activity. Although it was completed in time to be used by the war fighters, deployment of the test force to Naval Air Station China Lake required extraordinary priority (cost and effort) because of the complex logistics support, planning, and coordination. The test could have been completed at considerable savings of cost and effort if the Edwards AFB range had been certified for use of armed munitions.

1.6 ISSUES AND CONCERNS

During the scoping process representatives from Edwards AFB, AFFTC Environmental Management Office, Explosive Ordnance Disposal Office, Range Safety, and others identified the following issues and concerns as requiring a detailed assessment when considering the potential environmental effects of the Proposed Action and Alternatives.

1.6.1 Issues and Concerns Studied in Detail

Air Quality—Proposed operational air quality impacts and the Proposed Action's conformity to the Federal Clean Air Act (CAA).

Airspace—Impacts of armed munitions on the airspace at the site of the Proposed Action and impacts on the airspace required for the testing of weapons delivery at PB-13.

Cultural Resources—Potential to impact cultural resources resulting from weapons delivery and potential impacts upon Native American resources and/or values.

Geology and Soils—Soil erosion impacts associated with project implementation.

Hazardous Materials and Waste—Potential impacts of hazardous materials and waste associated with live munitions and disposal of dud munitions.

Land Use—Potential impact on the use of a designated target site and the impact of designating the Proposed Action site for a limited purpose.

Natural Resources—Nature, extent, and impact on biological resources within and around the region of interest.

Noise—Potential noise impacts associated with the Proposed Action and Alternatives.

Safety and Occupational Health—Potential safety issues associated with the delivery of armed munitions on the Proposed Action site and short-/ long-term impacts on personnel conducting routine cleanup.

Water Resources—Impacts of the Proposed Action and Alternatives on local water quality (surface and groundwater).

1.6.2 Issues and Concerns Eliminated From Detailed Study

The following issues and concerns were initially considered, but subsequently eliminated from further consideration in this EA: Socioeconomics, Environmental Justice and Protection of Children, Infrastructure, Energy Resources, and Public/Emergency Services. These issues will only be briefly mentioned, in Chapters 3 and 4.

1.7 ENVIRONMENTAL IMPACT ANALYSIS PROCESS

The NEPA established a national policy to protect the environment and ensure that federal agencies consider the environmental effects of actions in their decision-making. The CEQ is authorized to oversee and recommend national policies to improve the quality of the environment. The CEQ published regulations that describe how NEPA should be implemented. These regulations encourage federal agencies to develop and implement procedures that address the NEPA process in order to avoid or minimize adverse effects on the environment. Title 32 CFR Part 1989 addresses implementation of NEPA as part of the Air Force planning and decision-making process.

1.8 FUTURE OF THIS DOCUMENT

Future proposed projects would be reviewed and evaluated to determine if they fall within the scope of this EA. If so, then these projects may use the analysis presented here for a categorical exclusion (CATEX) or tier off this document. In some cases, a supplement to this EA may be required. If a supplemental EA were required, a new Finding of No Significant Impact (FONSI) would be necessary. Future actions that are found to result in a significant environmental impact that could not be mitigated to a level of insignificance would need to be addressed in an Environmental Impact Statement.

1.9 STRUCTURE OF THIS EA

This EA presents the analysis and description of potential environmental effects that could result from the Proposed Action and Alternatives. As appropriate, the affected environment and environmental consequences of the Proposed Action and Alternatives are presented in terms of regional and site-specific descriptions.

Chapter 2.0 contains descriptions of Alternative A (Proposed Action), Alternative B, Alternative C, and Alternative D (No-Action Alternative). Project information and the general parameters associated with the Proposed Action are also described in Chapter 2.0.

Chapter 3.0 provides detailed regional and site-specific information related to air quality, airspace, cultural resources, geology and soils, hazardous materials/hazardous waste, land use, natural resources, noise, safety and occupational health, and water resources. The regional information included in this section provides the background for understanding the context of the site-specific information that could affect or be affected by the Proposed Action and Alternatives.

Chapter 4.0 addresses the potential effects of the Proposed Action and Alternatives on the resource areas analyzed.

Chapters 5.0 through 8.0 identify references, persons and agencies contacted, preparers of this EA, and acronyms and abbreviations, respectively.

Appendix A contains the results of an air quality analysis conducted for the proposed project. The distribution list for this EA is included in Appendix B. Appendix C contains the responses to comments received from the public and stakeholders.

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2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and Alternatives, including the No-Action Alternative. Alternative A, the Proposed Action, is to designate the West Range precision bombing target, PB-13, as an armed munitions only target with a capacity of 100 weapons delivery events per year. Alternatives B and C are similar to Alternative A, except the armed munitions weapons delivery events would be limited to 50 and 10 events per year, respectively. For all three alternatives, armed munitions are defined as a munition with a NEW limited to 500 pounds. The weapons would be delivered in either an air-to-ground or ground-to-ground mode. The residual effects would be cleared from the target site prior to the next armed munition delivery event. Runway 22 would be used for air-to-ground missions. No off-road vehicles would be required for ground-to-ground missions.

Alternative D, the No-Action Alternative, is the status quo with the target remaining as a precision bombing target for inert and practice bombs. Also included in this chapter are the criteria used to select the alternatives and a brief discussion of the alternatives considered but eliminated from further study. The potential environmental effects of each alternative are summarized in table form at the end of this chapter.

2.1 DEVELOPMENT OF ALTERNATIVES

The analysis of the Proposed Action and Alternatives is the cornerstone of the EA. It is intended to provide the decision maker and the public a clear understanding of the relevant issues and the basis of the choice among identified options. A reasonable range of alternatives is required by NEPA. Alternatives that meet the basic Purpose and Need in this EA were developed based on the following guidelines:

- Assessment of current capabilities against projected needs to support the AFFTC mission; capabilities required include:
  - Maximum number of events based on anticipated future requirements; and
  - Alternatives to provide limited and minimum capability.
- Review of applicable guidelines for land use and resource management;
- Identification of public concerns and issues through a public review process.

2.2 SELECTION CRITERIA FOR ALTERNATIVES

As stated in Chapter 1, the 412 TW needs a designated armed munitions weapons target at Edwards AFB to support the mission of the AFFTC. During the alternative selection process, other potential targets and ranges were considered that could support live munitions weapons testing. Selection criteria were developed to help identify viable alternatives and eliminate unreasonable alternatives from additional study. Selection criteria included the following:

- Reasonable alternatives must fulfill the need and purpose of the Proposed Action; and
- The alternatives must be consistent with the goals, policies, management strategy, and mission requirements for AFFTC and Edwards AFB; and
- Impacts to natural and cultural resources must be minimal or be mitigated with resources and effort to a level that is less than significant; and
- The target should be in a remote area.

Alternatives that did not meet these criteria were eliminated from further consideration.

The current activities on the PIRA are defined by eight elements. Table 2-1 lists those elements where no changes in activities are anticipated for each of the alternatives. These same activities apply to the use of PB-13 as an armed munitions target and are carried out as specified in numerous regulations, instructions, manuals, standards, policy directives, technical letters, and technical orders that are part of the administrative record.

Table 2-1

Current Activities on the PIRA and Elements Where No Changes to Activities are Anticipated for Alternatives

Activities/Elements	Alternative A	Alternative B	Alternative C	Alternative D
Mission/Flying Operations				X
Facilities and Infrastructure	X	X	X	X
Operating Areas	X	X	X	X
Instrumentation Systems	X	X	X	X
Controlled Airspace	X	X	X	X
Maintenance				X
Facility Upgrades	X	X	X	X
Range Cleanup/Explosive Ordnance Disposal (EOD) Operations				X

Note: X denotes activities/elements where no changes are anticipated to occur as a result of the selected alternatives.

2.3 ALTERNATIVE A—DESIRED CAPABILITY—DESIGNATE PB-13 AS AN ARMED MUNITIONS ONLY TARGET WITH A CAPACITY OF 100 WEAPONS DELIVERY EVENTS PER CALENDER YEAR (PROPOSED ACTION)

Under Alternative A, target PB-13 would be designated an armed munitions only target with a capacity of 100 weapons delivery events per calendar year. Alternative A represents the Proposed Action and would be consistent with current use of the PIRA.

2.3.1 PB-13 Site Description

Precision bombing target PB-13 is located at T9N, R8W, Sections 20 and 21. The elevation of PB-13 is 2,426 feet above mean sea level (MSL). The target's center is located at latitude 34 degrees 51.30 minutes N and longitude 117 degrees 44.17 minutes W. The target is located in a remote area of the range that is approximately 8.3 miles from Hi Vista, the closest off-base community (Figure 2-1). The target surface is a 1,000-foot diameter graded surface consisting primarily of loams, sandy loams, and clay soils (Figures 2-2 and 2-3).

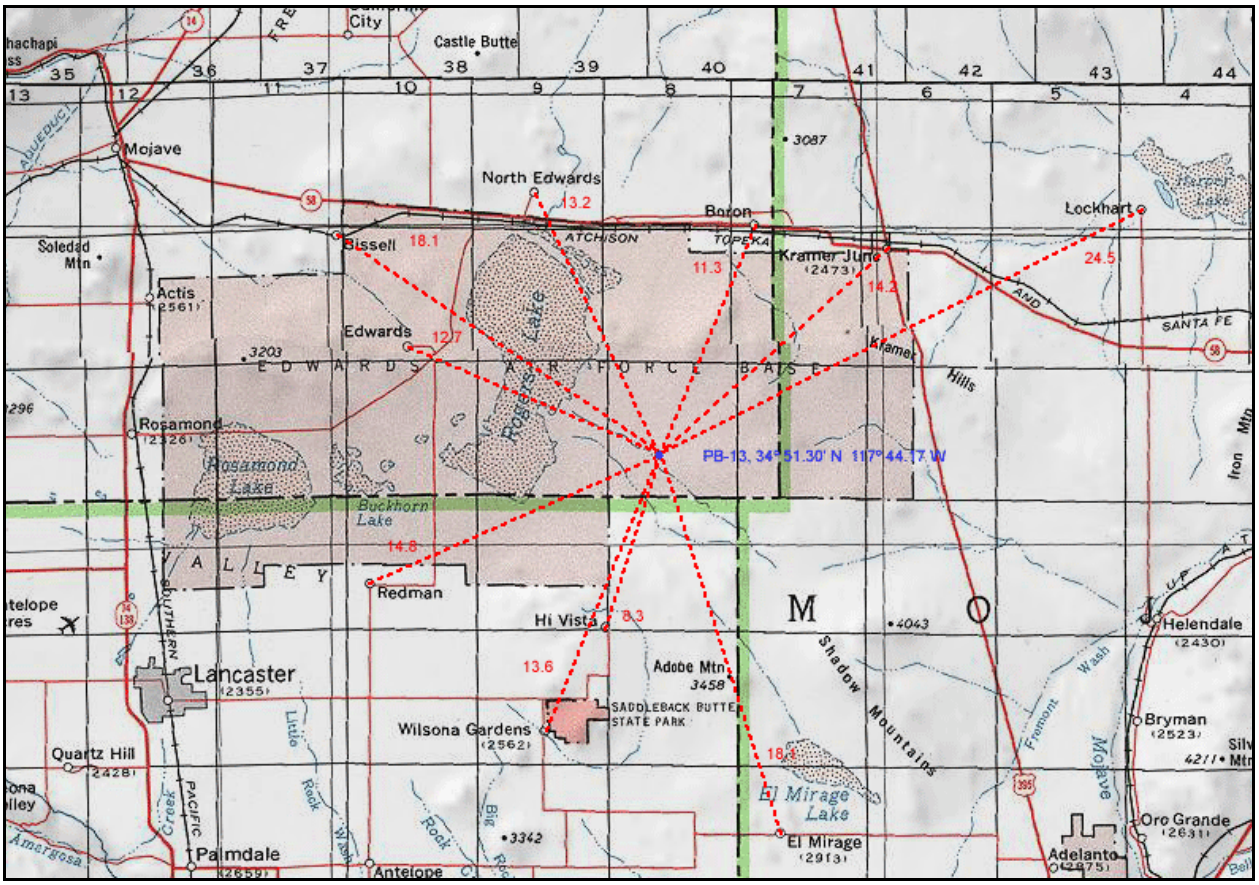

Figure 2-1 Distances from PB-13 to Local Communities in Miles

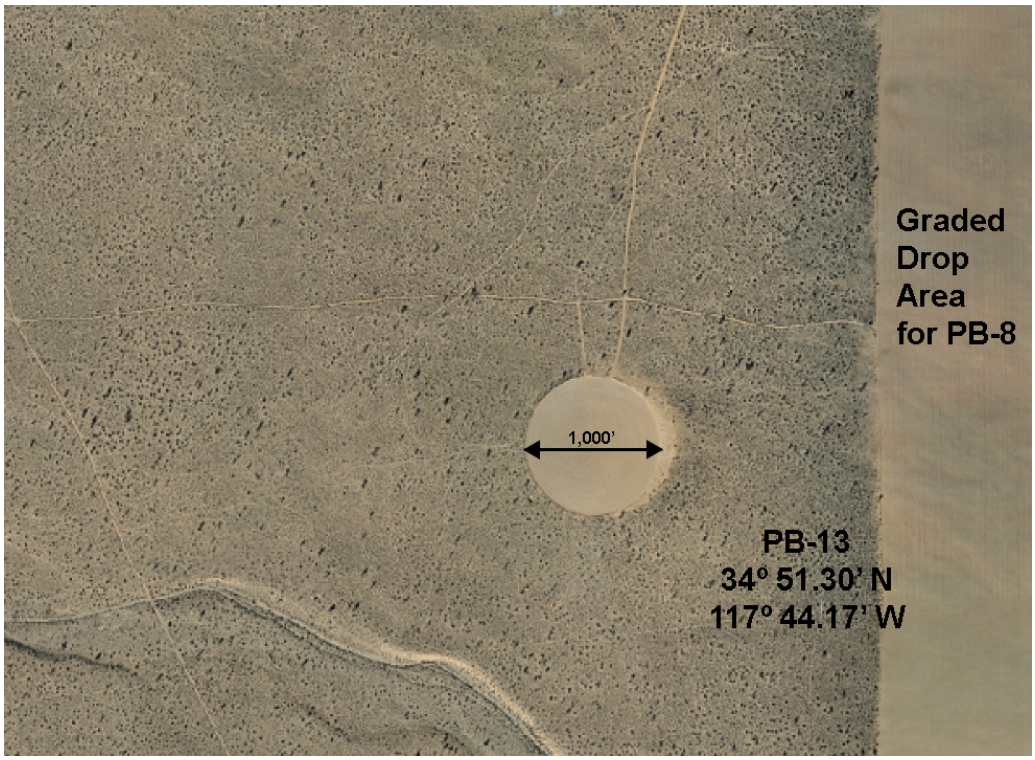

Figure 2-2 Aerial View of PB-13

Figure 2-3 Ground Level View of PB-13

2.3.2 Mission/Flying Operations

Under the Proposed Action, up to 100 weapons delivery events would occur annually. Either single or multiple munitions could be delivered, depending on the integration testing requirements. Mission aircraft would comply with approved flight profiles and weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions.

2.3.3 Maintenance

Range maintenance would be accomplished in accordance with Air Force Instruction (AFI) 13-212, *Range Operations and Planning*.

2.3.4 Range Clearance/Explosive Ordnance Disposal Operations

The target would be cleared of any duds and/or fragments according to range maintenance policy and AFI 13-212. Specific mitigation for this Proposed Action would include clearing the target area of any duds after each mission and before any additional armed munitions are dropped on the target. A written record of the cleanup activities would be kept by the Explosive Ordnance Disposal (EOD).

2.4 ALTERNATIVE B—LIMITED CAPABILITY—DESIGNATE PB-13 AS AN ARMED MUNITIONS ONLY TARGET WITH A CAPACITY OF 50 WEAPONS DELIVERY EVENTS PER CALENDER YEAR

Under Alternative B, PB-13 would be designated an armed munitions only target with a capacity of 50 weapons delivery events per calendar year.

2.4.1 Mission/Flying Operations

Under Alternative B, up to 50 weapons delivery events would occur annually. Either single or multiple munitions could be delivered, depending on the integration testing requirements. Mission aircraft would comply with approved flight profiles and weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions.

2.4.2 Maintenance

Range maintenance would be accomplished in accordance with AFI 13-212, *Range Operations and Planning*.

2.4.3 Range Clearance/Explosive Ordnance Disposal Operations

The target would be cleared of any duds and/or fragments according to range maintenance policy and AFI 13-212. Specific mitigation for Alternative B would include clearing the target area of any duds after each mission and before any additional armed munitions are dropped on the target. A written record of the cleanup activities would be kept by EOD.

2.5 ALTERNATIVE C—MINIMUM CAPABILITY—DESIGNATE PB-13 AS AN ARMED MUNITIONS ONLY TARGET WITH A CAPACITY OF 10 WEAPONS DELIVERY EVENTS PER CALENDER YEAR

Under Alternative C, target PB-13 would be designated as an armed munitions only target with a capacity of 10 weapons delivery events per calendar year.

2.5.1 Mission/Flying Operations

Under Alternative C, up to 10 weapons delivery events would occur annually. Either single or multiple munitions could be delivered, depending on the integration testing requirements. Mission aircraft would comply with approved flight profiles and weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions.

2.5.2 Maintenance

Range maintenance would be accomplished in accordance with AFI 13-212, *Range Operations and Planning*.

2.5.3 Range Clearance/Explosive Ordnance Disposal Operations

The target would be cleared of any duds and/or fragments according to range maintenance policy and AFI 13-212. Specific mitigation for Alternative C would include clearing the target area of any duds after each mission and before any additional armed munitions are dropped on the target. A written record of the cleanup activities would be kept by EOD.

2.6 ALTERNATIVE D —NO-ACTION ALTERNATIVE

Under Alternative D, the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions.

2.7 ALTERNATIVES CONSIDERED BUT ELIMINATED

Initially the conversion of the entire PIRA to an armed munitions range was considered; however, due to the other T&E requirements, this alternative was eliminated.

Within the current PIRA operating areas there are numerous targets that were considered for the Proposed Action, however, they were eliminated from further consideration for the reasons discussed below. These include precision bombing (PB) targets that are presently designated for bombing; visual/photographic support; lighting arrays; bombing and laser; and bombing, laser, and airdrop missions.

The current Biological Opinion divides the PIRA into three Desert Tortoise Management Zones based on known densities of the tortoises and level of activities associated with the use of the PIRA.[1] Precision Bombing Target 6 (PB-6), located in the extreme northeastern section of the PIRA, was eliminated as an alternate target location for the following reasons.

- It is located in desert tortoise (*Gopherus agassizii*) critical habitat in PIRA Management Zone 2, within the Fremont-Kramer Desert Wildlife Management Area (Fremont-Kramer DWMA). The Fremont-Kramer DWMA is one of six critical habitat units established by the USFWS for recovery of the federally threatened desert tortoise.

- There are known cultural artifacts in the target's vicinity.

This decision supports the AFFTC posture for environmental stewardship and protection of irreplaceable resources.

Other single and multiple targets on the PIRA failed to meet the anticipated safety requirements needed for armed munitions weapons integration and testing. Review of the infrastructure support requirements for precision targets in the Desert Tortoise Management Zone 1 reduced the list of targets considered to PB-13.

Other ranges that were considered failed to meet the purpose and goals of the AFFTC and Edwards AFB. Among those considered but eliminated were:

- Utah Test and Training Range, Utah;

[1] Zone 1 represents low desert tortoise density in the heaviest use area. Zone 2 represents moderate desert tortoise density and the current rate of activity. Zone 3 represents high desert tortoise density and a minimal level of activity. See Chapter 3 for further discussion.

- Nevada Test and Training Range, Nevada;
- Naval Air Warfare Center, Weapons Division, Point Mugu, California;
- Naval Air Warfare Center, Weapons Division, China Lake, California;
- 30th Space Wing, Vandenberg AFB, California; and
- Air Force Air Armament Center 46th Test Wing, Florida.

The funding required to regularly relocate project personnel to other ranges to conduct these tests could impact the timely introduction of the weapons needed to support precision and surgical strike requirements of the warfighter.

2.8 OTHER FUTURE ACTION IN THE REGION

Other actions within the region were evaluated to determine whether cumulative environmental effects could result from implementing the Proposed Action or one of the Alternatives. Cumulative effects result from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Other actions within the geographic region of Edwards AFB and the R-2508/R-2515 special use airspace that could be considered to have the potential for cumulative effects include other flight test programs and weapons delivery testing. However, because of the limited number of designated armed munitions targets in the region, the remoteness of the target site, stringent range safety requirements, and the requirement for specific test plan approval prior to each action, these actions are not expected to have any significant cumulative effects.

2.9 COMPARISON OF ENVIRONMENTAL EFFECTS

Table 2-2 provides a summary of anticipated environmental effects for each alternative.

Table 2-2

Anticipated Environmental Effects for the Affected Environment

Issue	Alternative A	Alternative B	Alternative C	Alternative D
Air Quality	Minimal	Minimal	Minimal	None
Airspace	Minor	Minimal	Minimal	None
Cultural Resources	None	None	None	None
Geology and Soils	Minor	Minimal	Minimal	None
Hazardous Material/Waste	Minimal	Minimal	Minimal	None
Land Use	Minor	Minimal	Minimal	None
Natural Resources	Minor	Minor	Minimal	None
Noise and Vibration	Minor	Minor	Minor	None
Safety	Minor	Minimal	Minimal	None
Water Resources	Minimal	Minimal	Minimal	None

Notes: Rating scale is used within the attribute table only.

Minimal: Impacts that are not expected to be measurable or are measurable but are too small to cause any change in the environment.

Minor: Potential adverse impacts that are measurable, but are within the capacity of the impacted system to absorb the change or the impacts can easily be mitigated with little effort and resources so that they are not significant.

Moderate: Potentially adverse impacts that are measurable, but do not violate any laws or regulations and are within the capacity of the impacted system to absorb the change to impacts, can be mitigated with effort and resources so that they are not significant.

Major: Potentially adverse impacts that individually or cumulatively could be significant.

None: No impacts expected.

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3.0 AFFECTED ENVIRONMENT

This chapter describes existing environmental conditions likely to be affected by Alternatives A, B, and C. The Region of Influence (ROI) consists of Edwards AFB, specifically the PB-13 target on the PIRA. The ROI for each action will be discussed in terms of two distinct regions: (1) on-base region, and (2) PB-13 target on the PIRA. The on-base region comprises all of Edwards AFB.

Resources within the ROI have been identified under the following categories: air quality, airspace, cultural resources, *environmental justice and protection of children*, geology and soils, hazardous waste/hazardous materials, *infrastructure*, *energy resources*, land use, natural resources, noise, *public/emergency services*, safety and occupational health, *socioeconomics*, and water resources. Resource categories shown in italics will be briefly covered in their respective section.

3.1 AIR QUALITY

Air quality in a given location is defined by the concentration of various pollutants in the atmosphere and is typically expressed in parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). By comparing a pollutant concentration in the atmosphere to federal and/or state ambient air quality standards, the significance of its presence can be determined. These standards represent the maximum allowable atmospheric concentrations that may occur while still protecting public health and welfare with a reasonable margin of safety. The federal standards are established by the U.S. Environmental Protection Agency (U.S. EPA) and are termed the National Ambient Air Quality Standards (NAAQS). The NAAQS are defined as maximum acceptable ground-level concentrations that may not be exceeded more than once per year, with the exception of annual standards that may never be exceeded. These standards include concentrations for ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), and lead. The California Air Resources Board (CARB) has established state standards termed the California Ambient Air Quality Standards (CAAQS). The CAAQS are at least as restrictive as the NAAQS and include pollutants for which there are no national standards. The national and state ambient air quality standards are shown in Table 3-1.

The pollutants considered in the impact analysis of this EA include volatile organic compounds (VOCs), ozone, CO, NO_2, SO_2, and PM_{10}. Conformity guidelines do not present threshold levels for particulate matter 2.5 microns or less in diameter ($PM_{2.5}$) and no known sources of lead are associated with the

Table 3-1

National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	National Standards[a]	
			Primary[b,c]	Secondary[b,d]
Ozone	1-hour	0.09 ppm	0.12 ppm	same as primary
	8-hour	---	0.08 ppm	same as primary
Carbon monoxide	1-hour	20 ppm	35 ppm (40 mg/m^3)	none
	8-hour	9.0 ppm	9 ppm (10 mg/m^3)	none
Nitrogen dioxide	1-hour	0.25 ppm	---	---
	Annual (arithmetic mean)	---	0.053 ppm (100 $\mu g/m^3$)	same as primary
Sulfur dioxide	1-hour	0.25 ppm	---	---
	3-hour	---	---	0.5 ppm (1,300 $\mu g/m^3$)
	24-hour	0.04 ppm	0.14 ppm	---
	Annual (arithmetic mean)	---	0.03 ppm	---
PM_{10}	24-hour	50 $\mu g/m^3$	150 $\mu g/m^3$	---
	Annual (arithmetic mean)	20 $\mu g/m^3$	50 $\mu g/m^3$	same as primary
$PM_{2.5}$	24-hour	---	65 $\mu g/m^3$	---
	Annual (arithmetic mean)	12 $\mu g/m^3$	15 $\mu g/m^3$	same as primary
Lead	30-day average	1.5 $\mu g/m^3$	---	---
	quarterly average	---	1.5 $\mu g/m^3$	same as primary

Notes: a – Other than for ozone and those based upon annual averages, standards are not to be exceeded more than once per year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

b – Concentrations are expressed first in the units in which they were promulgated. Equivalent units are given in parentheses.

c – Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than 3 years after the U.S. EPA approves the state's implementation plan.

d – Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the EPA approves the implementation plan.

EPA – Environmental Protection Agency

Table 3-1 (Continued)

National and California Ambient Air Quality Standards

Notes: **(Continued)**

$\mu g/m^3$ – micrograms per cubic meter
mg/m^3 – milligrams per cubic meter
$PM_{2.5}$ – particulate mater equal to or less than 2.5 microns in diameter
PM_{10} – particulate mater equal to or less than 10 microns in diameter
ppm – parts per million

Source: California Air Resources Board, www.arb.ca.gov/aqs/aaqs2.pdf, accessed on 8/30/04

proposed project; therefore, $PM_{2.5}$ and airborne emissions of lead are not considered in this EA. Emission of NO_2 and VOCs is of particular concern, as they are precursors to the formation of ozone.

Ozone concentrations are generally highest during the summer and coincide with the period of maximum insolation, or the maximum amount of solar radiation striking the earth's surface. Maximum ozone concentrations tend to be regionally distributed due to the homogeneous dispersion of precursor emissions in the atmosphere. Concentrations of inert pollutants, such as CO, tend to be the greatest during the cooler months of the year and are often a product of light wind conditions and nighttime/early morning surface-based inversions. Maximum inert pollutant concentrations are usually found near an emission source.

Evaluating impacts to air quality in the ROI requires knowledge of (1) the types of pollutants being emitted, (2) emission rates of the pollutant source, (3) the proximity of project emission sources to other emission sources, (4) topography, and (5) local and regional meteorological conditions. The area of effect for emissions of inert pollutants (pollutants other than ozone and its precursors) is generally limited to a few miles downwind from the source. The area of effect for ozone generally extends much further downwind. In the presence of solar radiation, the maximum effect of precursor emissions on ozone levels usually occurs several hours after their release, and therefore, many miles from the source.

The U.S. EPA designates all areas of the United States as having air quality better than (attainment) or worse than (non-attainment) the NAAQS. The criteria for non-attainment designation vary by pollutant. An area is (1) in non-attainment for ozone if its NAAQS has been exceeded more than three discontinuous times in 3 years at a single monitoring station and an area is (2) in non-attainment for any other pollutant if its NAAQS has been exceeded more than once per year. Pollutants in an area are often designated as unclassified when there are insufficient ambient air quality data for the U.S. EPA to form a

basis for attainment status. The CARB considers an area to be in non-attainment of a CAAQS for a particular pollutant if (1) the standards for ozone, CO (except Lake Tahoe), SO_2 (1- and 24-hour), NO_2, PM_{10}, and visibility reducing particles have been exceeded or (2) the standards for the remaining pollutants have been equaled or exceeded.

Air quality regulations were first promulgated with the CAA. This Act established the NAAQS and delegated the enforcement of air pollution regulations to the states. In areas where the NAAQS are exceeded, the CAA requires preparation of a State Implementation Plan (SIP) that describes how a state will attain the standards within mandated time frames. The CAA Amendments revised the attainment planning process, basing new requirements and compliance dates for reaching attainment upon the severity of the air quality standard violation.

Federal conformity guidelines included in the CAA Amendments state that a federal agency cannot support an activity unless the agency determines that the activity will conform to the state's most recent SIP approved by the U.S. EPA within the region of the proposed action. These guidelines state that federally supported or funded activities must show that the proposed actions will not (1) cause or contribute to any new air quality standard violation in any area, (2) interfere with programs outlined in any SIP for maintenance of any standard, (3) increase the frequency or severity of any existing standard violation in any area, or (4) delay the timely attainment of any standard or any required interim emission reductions or other milestones in any area. The activities proposed herein are considered exempt from this rule as long as there is no increase in emissions above the *de minimis* levels specified in the rule. Therefore, a screening to determine the applicability of the conformance guidelines was performed. Table 3-2 presents the *de minimis* threshold levels presented in the conformity rule for non-attainment areas.

Ensuring reasonably foreseeable direct and indirect emissions do not exceed the *de minimis* thresholds comprises only half of the screening process. In addition to this requirement, a federal action must also not be considered regionally significant. A regionally significant action is defined as a federal action for which direct and indirect emissions of any pollutant represent 10 percent or more of a nonattainment or maintenance area's emissions inventory for that pollutant.

If a federal action meets both of the abovementioned criteria, it is exempt from further conformity analysis pursuant to 40 CFR Part 93.153. However, although an action may be considered exempt, should it be altered in any way that causes an increase in the reasonably foreseeable emissions, or if

Table 3-2

Conformity Analysis De Minimis Thresholds

Pollutant	Degree of Non-attainment	*De Minimis* Level (tons/year)
Nonattainment Areas		
Ozone (VOCs or NO_2)	Serious	50
	Severe	25
	Extreme	10
	Marginal and Moderate (outside an ozone transport region)	100
	Marginal and Moderate (inside an ozone transport region)	50 (VOC) 100 (NO_2)
CO	All	100
PM_{10}	Moderate	100
	Serious	70
SO_2 or NO_2	All	100
Lead	All	25

Notes: CO – carbon monoxide
NO_x – nitrogen oxides
NO_2 – nitrogen dioxide
SO_2 – sulfur dioxide
VOC – volatile organic compound

Source: 40 CFR, Chapter I, Subchapter C, Part 51.853, last updated July 2003

attainment areas are reclassified based on changes to NAAQS or the EPA-approved SIP, a revision to the conformity analysis may be required.

The impact on visibility from air pollutant emission sources is an issue with regard to federally mandated Class 1 areas, such as national parks and wilderness areas, where any appreciable deterioration in air quality is considered significant.

Areas in attainment with the NAAQS are regulated under the Prevention of Significant Deterioration (PSD) program authorized by the CAA Part C, Sections 160–169. PSD areas require owners and/or operators of new or modified sources to obtain a PSD permit prior to construction of a major source (40 CFR Part 5221) in attainment or unclassified areas. A major source is defined by PSD regulations as

being a specific type of source listed by the U.S. EPA that has a potential of emitting 100 tons per year of a regulated pollutant. Potential to emit is based on the maximum design capacity of a source and takes into account pollution control efficiency. If the U.S. EPA does not list a source, it may still be considered major if it has the potential to emit 250 tons per year of a regulated pollutant.

3.1.1 On-Base Region

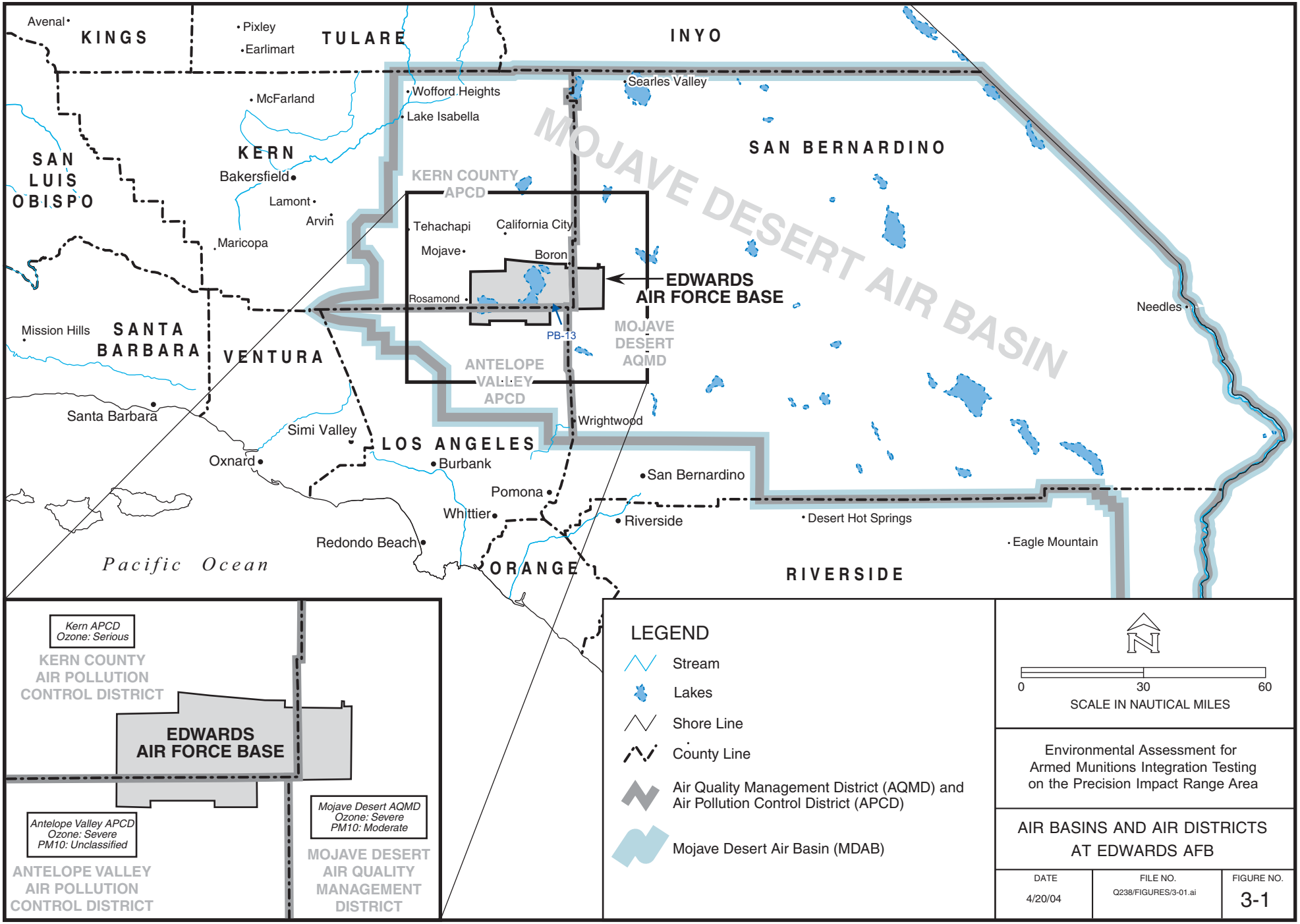
The following sections provide a description of the climate, baseline air quality and emissions, and regulatory setting for Edwards AFB. The affected environment for air quality would be identical under Alternatives A, B, and C. Edwards AFB extends into Kern, San Bernardino, and Los Angeles Counties within the Mojave Desert Air Basin (MDAB) of eastern California and is located within the jurisdiction of three local air districts: Kern County Air Pollution Control District (KCAPCD), Mojave Desert Air Quality Management District, and Antelope Valley Air Pollution Control District as shown in Figure 3-1.

The main base at Edwards AFB is located in the eastern portion of Kern County, which is under the jurisdiction of the KCAPCD. Because the activities proposed herein that could impact air quality occur on the main base, discussions of environmental effects to air quality are analyzed in relation to baseline air quality in the KCAPCD.

Climate

Hot summers, cool winters, low rainfall, large diurnal ranges in temperature, and abundant sunshine characterize the climate at Edwards AFB. The arid climate of the region is mainly due to rainshadow effects of the Sierra Nevada and San Gabriel Mountains, where the prevailing westerly winds deposit most of their moisture on the western slopes of these mountain ranges. Data collected at Edwards AFB from 1979 to 1989 are used to describe the climate of the project region (National Oceanic and Atmospheric Administration 2004).

The dominant weather feature in the project region is the Eastern Pacific high-pressure system. This system is most prevalent during the summer, when it occupies a northern position over the Pacific Ocean. Concurrent with the presence of high pressure, a low-level, thermal low-pressure system persists over the desert regions due to intense surface heating. The relative strengths and positions of the high-pressure system and the interior thermal trough are largely responsible for the general climatic conditions of the region.



Environmental Assessment for Armed Munitions Integration Testing on the Precision Impact Range Area

AIR BASINS AND AIR DISTRICTS AT EDWARDS AFB

DATE	FILE NO.	FIGURE NO.
4/20/04	Q238/FIGURES/3-01.ai	3-1

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Precipitation

During the winter, the Eastern Pacific high-pressure system weakens and moves southward, allowing polar storm systems to migrate through the region. Although the systems that reach the region have dried out considerably after traversing the elevated terrain to the west, they are responsible for most of the annual precipitation in the area. The average annual precipitation at Edwards AFB is 4.9 inches. Rainfall during the summer usually occurs from thunderstorms. Moisture from these storms originates from tropical air masses that move into the region from the south-southeast. Snow can occur in the region, although the average total is only about 2 inches per year.

Temperature

The annual average temperature at Edwards AFB is 62 degrees Fahrenheit (°F). Daily mean high and low temperatures for January are 57° F and 31° F, respectively. Daily mean high and low temperatures for July are 98° F and 66° F, respectively. Extreme temperatures that occurred during the 10-year monitoring period ranged from 4° F to 113° F.

Prevailing Winds

The combination of the Eastern Pacific high-pressure system over the Pacific Ocean and the thermal low over the interior desert produces a prevailing southwest wind in the region. Strong winds occur during the spring and summer, when the pressure gradient between the offshore Pacific High and the interior thermal trough is the greatest. However, extreme wind gusts can also occur with thunderstorms. Calm conditions increase during the fall and winter, when cold continental air replaces the thermal low and produces weak pressure gradients.

Baseline Air Quality Emissions

The MDAB is currently impacted by fugitive dust emissions. Table 3-3 presents a summary of the attainment status of the project area in California. These data show that the majority of the region is in non-attainment of both state and national standards for PM_{10} and ozone. It should be noted that the area was recently designated as in attainment of the national 1-hour ozone standard but remains in nonattainment of both the national 8-hour ozone standard and the state standard. Therefore, this area was still considered a nonattainment area for ozone when conducting the screening process to determine applicability of the conformity guidelines. The area is in attainment or unclassified for the remaining criteria pollutants (CO, NO_2, and SO_2).

Table 3-3
National/California Ambient Air Quality Standards
Attainment Designations for the Project Area

County	Ozone	CO	NO_2	SO_2	PM_{10}
Kern/MDAB[(a)]					
National	N	U*	U*	U	N
California	N	U/A	A	A	U/N
San Bernardino/MDAB[(b)]					
National	N	U*	U*	U	N
California	N	A	A	A	N
Los Angeles County/MDAB					
National	N	U*	U*	U	U
California	N	A	A	A	N

Notes: Designation status: A=attainment, N=non-attainment, U=unclassified, and U*=unclassified/attainment.

a – With regard to the CAAQS for CO, the eastern portion of the county, located in the MDAB, is unclassified while the western portion of the county is in attainment. With regard to the NAAQS for PM_{10} the entire county within the MDAB is unclassified for the federal standard, except the Searles Valley Planning Area, which is non-attainment.

b – With regard to the NAAQS for ozone, the southwestern portion of San Bernardino County within the MDAB is non-attainment, and the northwestern and eastern portion are considered unclassified/attainment. The area was recently determined to be in attainment for the 1-hour national ozone standard but remains in non-attainment of the 8-hour standard. Therefore, for the purpose of this screening process, the area was considered to remain in non-attainment for ozone.

CO – carbon monoxide
MDAB – Mojave Desert Air Basin
NO_2 – nitrogen dioxide
PM_{10} – particulate matter equal to or less than 10 microns in diameter
SO_2 – sulfur dioxide

Source: Proposed Amendments to the Area Designation Criteria and Area Designations for State Ambient Air Quality Standards and Maps of Area Designations for State and National Ambient Air Quality Standards, CalEPA ARB, December 5, 2003, available at www.arb.ca.gov/carbis/regact/area04/attachc.pdf, accessed 8/30/04. This information was supplemented with the latest information obtained from the Federal Register, April 22, 2004.

Eastern Kern County is located on the western edge of the Mojave Desert and is separated from populated valleys and coastal areas to the west and south by several mountain ranges. These valleys and coastal areas are the major source of ozone precursor emissions affecting ozone exceedances within Kern County's part of the MDAB. Although the sources of pollution in eastern Kern County do not by

themselves result in exceedances of the federal ozone standards, this region is largely impacted by ozone transport from both the San Joaquin Valley Air Basin and the South Coast Air Basin.

Elevated levels of PM_{10} are primarily associated with fugitive dust, which is produced through a combination of high winds, dry soil conditions resulting from an arid climate, and ground-disturbing activities such as mining, agriculture, and construction.

Regulatory Setting

In California, the CARB is responsible for enforcing air pollution regulations. The CARB has, in turn, delegated the responsibility of regulating stationary emission sources to local air agencies. There are no stationary sources of emissions associated with the proposed project. This area is within the eastern portion of Kern County, which is part of the MDAB. Therefore, the analysis will include only the portion of Kern County within the MDAB. In-flight aircraft emissions are generally unregulated within the project region, and are not considered for planning purposes over 3,000 feet above ground level (AGL).

As specified in an entry to the *Federal Register* on April 22, 2004, the MDAB region of Kern County is now in attainment of the national 1-hour NAAQS for ozone but remains in non-attainment for both the 8-hour national standard and the state standard. Therefore, the area was considered to be a non-attainment area and the corresponding *de minimis* level was utilized when conducting the conformity analysis screening presented in Appendix A and summarized in Section 4.1.

Table 3-4 provides a summary of aircraft emissions at Edwards AFB in 2003 for comparison to the flights associated with armed munitions delivery on the PIRA PB-13 target. These are baseline emissions for the upper atmosphere within the airspace at Edwards AFB.

Table 3-4

Summary of Existing Emissions at Edwards AFB (tons/year)

VOC	CO	NO_x	SO_2	PM_{10}
271.6	619.4	205.4	21.7	17.3

Notes: Represents emissions that occurred in 2003 (U.S. Air Force 2003).
CO – carbon monoxide
NO_x – nitrogen oxides
PM_{10} – particulate matter equal to or less than 10 microns in diameter
SO_2 – sulfur dioxide
VOC – volatile organic compound

Edwards AFB is situated in the MDAB portion of Kern County; therefore, current and forecasted baseline emissions for this portion of Kern County are listed in Table 3-5.

Table 3-5
MDAB Portion of Kern County
Baseline and Forecasted Emission Baseline (tons/year)

Year	VOC	NO_x	PM_{10}
1985[a]	8,395	9,855	9,855
1990[a]	7,665	14,235	16,060
1995[a]	4,745	10,585	10,585
2000[a]	4,380	11,315	11,315
2005[b]	4,380	10,950	12,410
2010[b]	4,015	10,950	13,505

Notes: a – Actual.
b – Estimated.
NO_x – nitrogen oxides
PM_{10} – particulate matter equal to or less than 10 microns in diameter
VOC – volatile organic compound

Source: California Environmental Protection Agency 2001.

3.1.2 Precision Impact Range Area, PB-13 Target

The affected environment for air quality for the PIRA and the PB-13 target under Alternatives A, B, and C would be identical to the affected environment described for the on-base region.

Generic Air Emissions from 500-pound Net Explosive Weight Armed Munitions

Because the nature of the explosives that would be used in the 500-pound bombs, rockets, or mortars has not been specifically identified, potential emissions were evaluated for generic Composition 4 (C4), trinitrotoluene (TNT), and Composition B. C4 is a semi-plastic, putty-like material that is used with the application blocks and for specialized purposes. Composition B is composed primarily of cyclotrimethylenetrinitramine (RDX) and TNT. Also referred to as cyclonite, or hexogen, RDX is a white crystalline solid usually used in mixtures with other explosives, oils, or waxes; it is rarely used alone. It has a high degree of stability in storage and is considered the most powerful and brisant crushing of the military high explosives. RDX has a greater explosive power than TNT. A discussion of the

potential regulatory repercussions of designating PB-13 as an armed munitions only target is included in Section 4.1.1.2.

3.2 AIRSPACE

3.2.1 Overview

Airspace is defined as the space that lies above a nation and comes under its jurisdiction. Although it is generally viewed as being unlimited, airspace is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use for aviation purposes. Under Public Law (P.L.) 85-725, the Federal Aviation Administration (FAA) is charged with the safe and efficient use of the nation's airspace and has therefore established certain criteria and limits for its use. In order to accomplish its task, the FAA utilizes the National Airspace System (NAS).

Part of the NAS includes Special Use Airspace (SUA). SUA consists of airspace wherein activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of those activities, or both (FAA 2000). Except for controlled firing areas, SUA areas are depicted on aeronautical charts. Generally SUA consist of the following:

- Prohibited Areas— There are no prohibited areas within the region of interest for the alternatives.

- Restricted Areas—These are areas that denote the existence of unusual, often invisible hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. An aircraft may not enter a restricted area unless permission has been obtained from the controlling agency. Restricted areas are depicted on aeronautical charts and are published in the *Federal Register*.

- Warning Areas—There are no warning areas within the region of interest for the alternatives.

- Military Operation Areas (MOAs)—These are areas that consist of airspace of defined vertical and lateral limits established for the purpose of separating certain military training activities from instrument flight rules (IFR) traffic. There is no restriction against a pilot operating in visual flight rules (VFR) in these areas; however, a pilot should be alert since training activities may include acrobatic and abrupt maneuvers. MOAs are depicted on aeronautical charts.

- Alert Areas—There are no alert areas within the region of interest for the alternatives.
- Controlled Firing Areas (CFAs)—There are no CFAs within the region of interest for the alternatives.

Detailed information on the restricted areas R-2515 and R-2508 SUA are available in the *R-2508 Users Guide*, which can be found at http://r2508.edwards.af.mil/. Armed munitions integration testing will be entirely within SUA restricted areas R-2515 within the R-2508 Complex.

3.2.2 Alternatives A, B, and C

3.2.2.1 On-Base Region

Special Use Airspace

Table 3-6 gives the name/number, effective altitude, time of use, and the controlling agency for the special use airspace within Alternatives A, B, and C. Special use airspace within Alternative A is shown in Figure 3-2.

There are 1,575 square miles of airspace that have been designated as restricted for use by DoD, National Aeronautics and Space Administration (NASA), and other government agencies. This airspace is over a remote area 40 to 60 miles north of Los Angeles, California. Known by its FAA designation as the R-2515, this airspace is scheduled, monitored, regulated, and controlled to provide safe aircraft test areas. Aircraft operation characteristics and altitudes are regulated in this airspace to minimize ground-based conflicts, which are primarily due to noise. The R-2515 complex encompasses portions of Kern, San Bernardino, and Los Angeles counties in east central California (NASA 1999).

Special use airspace within Alternative A includes the restricted area R-2515 over Edwards AFB. The Buckhorn, Panamint, and Isabella MOAs surround the R-2515 restricted area. There are no warning, prohibited, or alert special use airspace areas within Alternatives A, B, and C (National Geospatial-Intelligence Agency 2004).

Table 3-6

Special Use Airspace In and Surrounding Alternatives A, B, and C

Number/Name	Effective Altitude (feet)	Time of Use	Controlling Agency
R-2508 COMPLEX			
R-2508	FL 200 to Unlimited	Continuous	HI-DESERT TRACON
R-2515	Unlimited	Continuous	HI-DESERT TRACON
Buckhorn MOA	200 AGL[(b)]	0600–2200[(a)] M–F	HI-DESERT TRACON
Isabella MOA	200 AGL[(b,c)]	0600–2200[(a)] M–F	HI-DESERT TRACON
Panamint MOA	200 AGL[(b)]	0600–2200[(a)] M–F	HI-DESERT TRACON

Notes: a-Other times by NOTAM.
b- Up to but not including FL 180.
c- Excluding 3,000 feet AGL and below over Domeland Wilderness Area.
AGL- above ground level
FL- flight level (FL 180 = approximately 18,000 feet above mean sea level)
MOA- Military Operation Area
NOTAM- Notice to Airmen
R- restricted
TRACON- Terminal Radar Control

Source: National Aeronautical Charting Office 2004a, b, and c.

Military Training Routes

Alternatives A, B, and C contain one IR (IR-236), one Visual Route (VR) low-altitude military training route (VR-1293), and one slow-speed, low-altitude training route (SR-390) (Figure 3-3). All routes within the ROI that transit the boundaries of the R-2515 are governed by the flight restrictions and requirements to "see and avoid" other aircraft when operating under VFR. All routes are designated as "military assumes responsibility for separation of aircraft" (MARSA) operations, which are established by coordinated scheduling. Hours of operation are continuous except for IR-236, which operates daily from 0600 to 2200 hours local time (National Geospatial Intelligence Agency 2004).

All integration testing flight profiles for Alternatives A, B, and C are inside the boundaries of the R-2515.

En Route Victor Airways and Jet Routes

There are no en route victor low-altitude (up to but not including 18,000 feet above MSL) airways or high-altitude jet routes that transect the airspace within Alternatives A, B, or C (Figures 3-2, 3-4, and 3-5).

Airports/Airstrips

There are several airports/airstrips within the ROI for Alternatives A, B, and C. These include Edwards AF Aux North Base, Borax Private, and Edwards AFB (Figures 3-2 through 3-5).

Air Traffic Control

Alternatives A, B, and C lie exclusively within the Los Angeles Air Route Traffic Control Center's (ARTCC's) boundaries (National Aeronautical Charting Office [NACO] 2004 a, b, and c). The controlling agency for the Restricted Areas and MOAs within the R-2515 is TRACON. During the published hours of use (identified in Table 3-6), the using agency is responsible for controlling all military activity within the special use airspace and ensuring that its perimeters are not violated. When scheduled to be inactive the using agency releases the airspace back to the controlling agency (Los Angeles ARTCC), and in effect, the airspace is no longer restricted. If no activity is scheduled during some of the published hours of use, the using agency releases the airspace to the controlling agency for non-military operations for that period of inactivity (Illman 1993).

3.2.2.2 Precision Impact Range Area, PB-13 Target

The airspace above PB-13 is a subset of the area identified for the on-base region discussed in Section 3.2.1.1. The affected airspace is the same for Alternatives A, B, and C.

Special Use Airspace

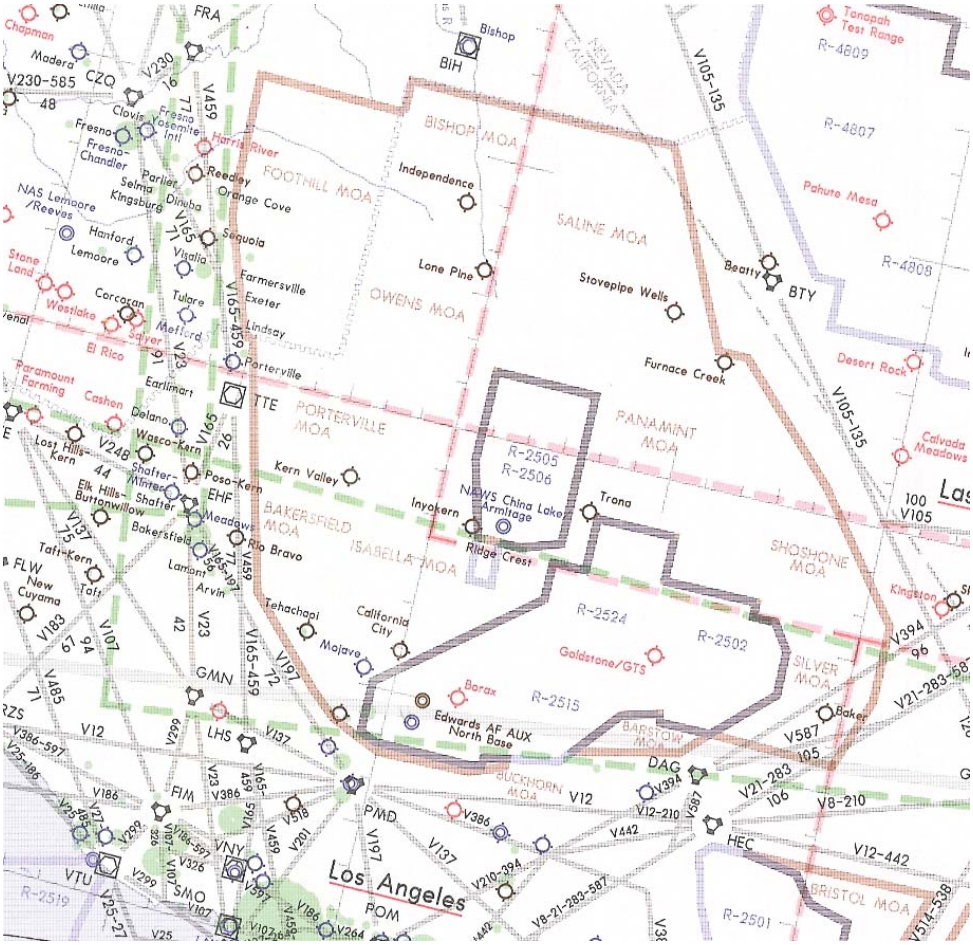
The PB-13 target is located within the R-2508 and R-2515 restricted areas. Table 3-6 gives the name/number, effective altitude, time of use, and the controlling agency for the special use airspace within Alternatives A, B, and C. There are no MOAs associated with the airspace above PB-13.

En Route Victor Airways and Jet Routes

There are no en route victor airways or jet routes that overfly the PB-13 target area.

Airports/Airstrips

There are no airports or airstrips in the PB-13 target area. The approach end of Rogers Dry Lake runway 27 is approximately 4 NM from the PB-13 target.



LEGEND

0 30 60 90

SCALE IN NAUTICAL MILES

- V32 — Victor Routes
- Cities
- Special Use Air Space and Warning Areas
- Civilian Airport (Private [Red])
- Military Airfields
- Military Operating Areas

Environmental Assessment for Armed Munitions Integration Testing on the Precision Impact Range Area

SPECIAL USE AIRSPACE, VICTOR EN ROUTE AIRWAYS, AND AIRPORTS UNDER ALTERNATIVES A, B, and C

DATE	FILE NO.	FIGURE NO.
4/26/04	Q238/FIGURES/ 3-02.ai	3-2

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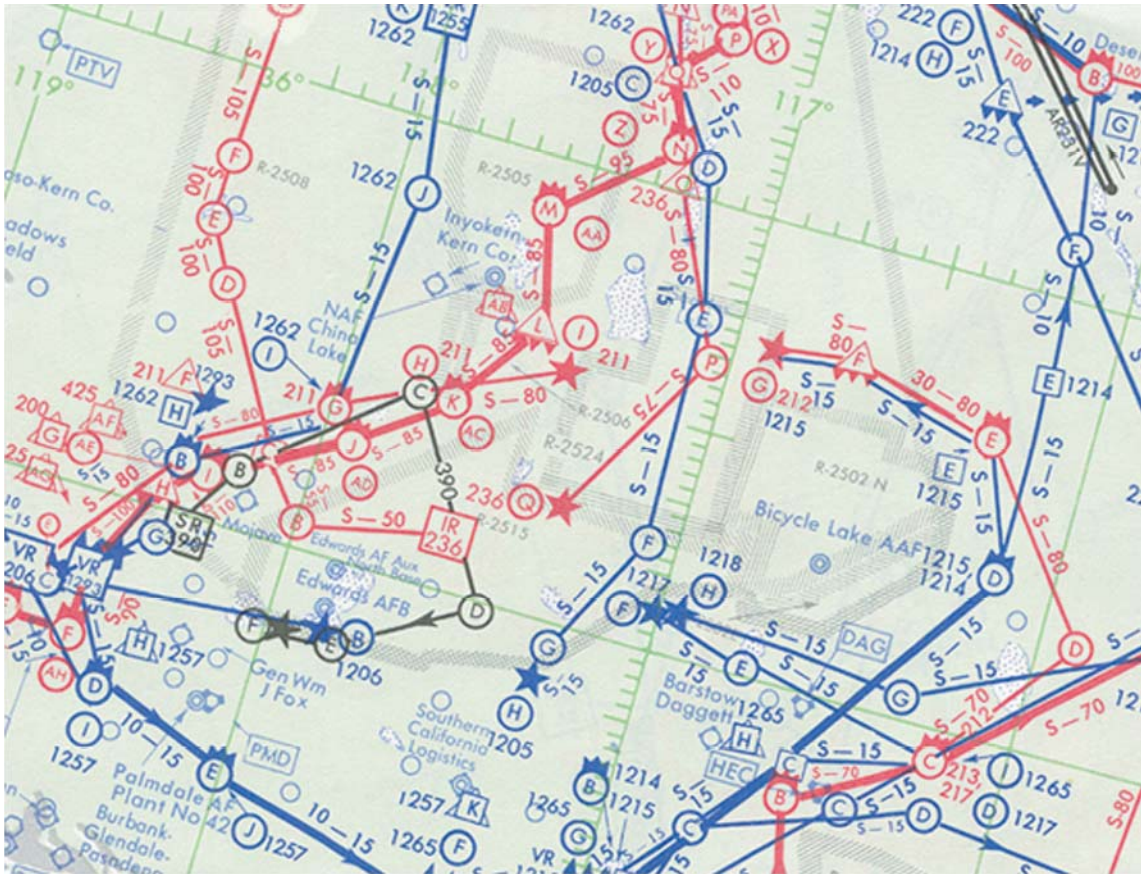

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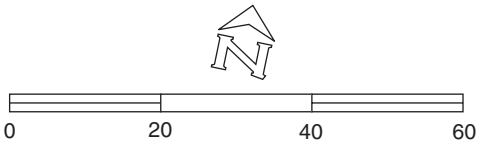

SCALE IN NAUTICAL MILES

- Civilian Airport
- Military Airfields
- Special Use Airspace and Warning Areas
- Instrument Route (IR) Military Training Route
- Visual Route (VR) Military Training Route
- Slow Route (SR) Military Training Route

Environmental Assessment for
Armed Munitions Integration Testing
on the Precision Impact Range Area

SPECIAL USE AIRSPACE,
MILITARY TRAINING ROUTES,
AND AIRPORTS
UNDER ALTERNATIVES A, B, and C

DATE	FILE NO.	FIGURE NO.
4/26/04	Q238/FIGURES/3-03.ai	3-3

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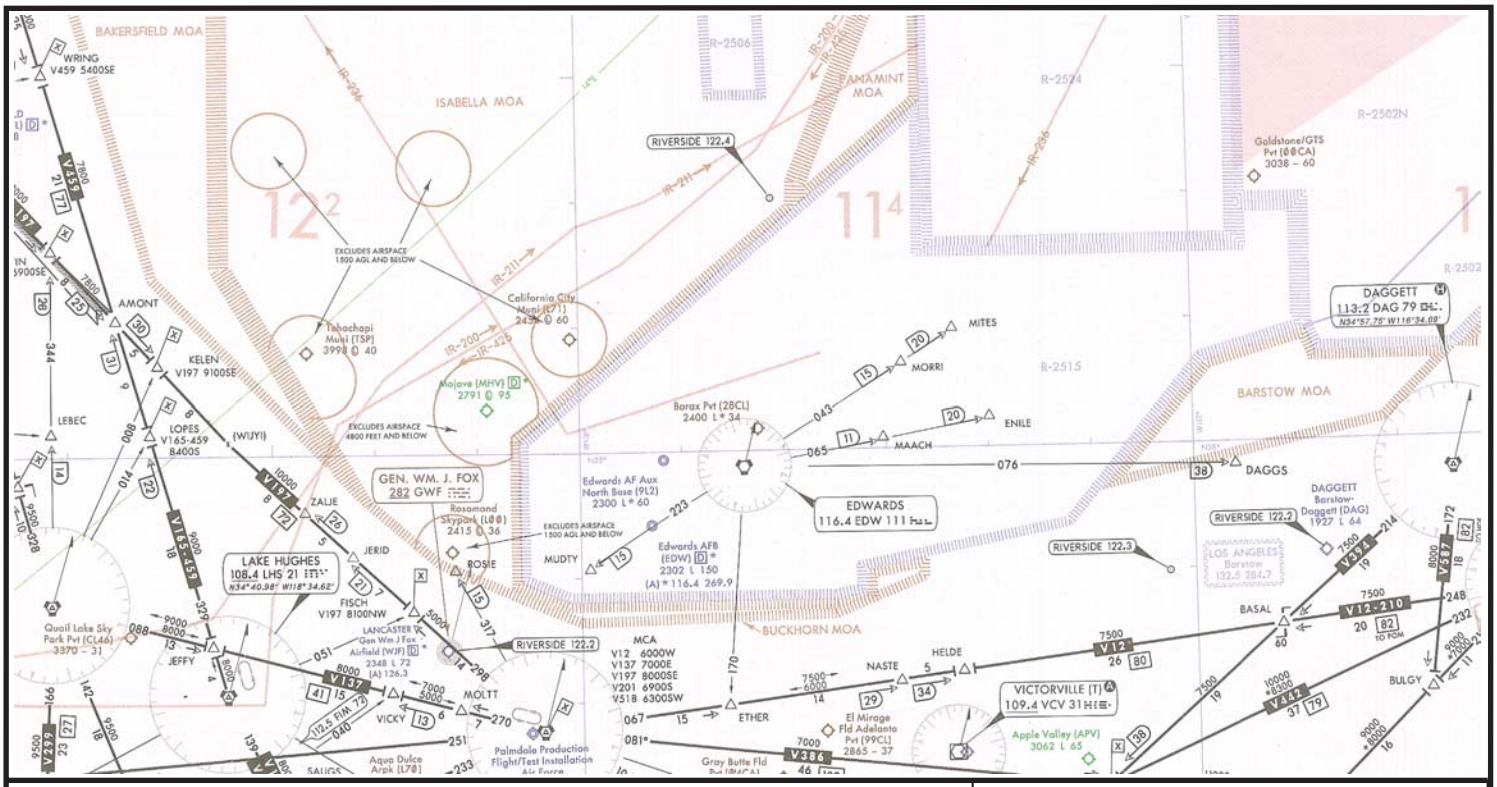

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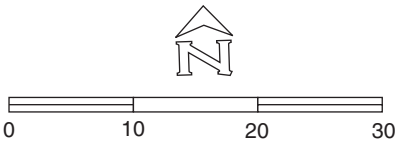

SCALE IN NAUTICAL MILES

V32 Victor Routes

Special Use Air Space and Warning Areas

Civilian Airport

Military Airfields

Military Operating Areas

Environmental Assessment for Armed Munitions Integration Testing on the Precision Impact Range Area

SPECIAL USE AIRSPACE, VICTOR ENROUTE AIRWAYS, AND AIRPORTS UNDER ALTERNATIVES A, B, and C

DATE	FILE NO.	FIGURE NO.
4/26/04	Q238/FIGURES/3-04.ai	3-4

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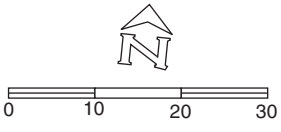
LEGEND



SCALE IN NAUTICAL MILES

Note: Airports shown have a minimum of 5,000 feet of hard surface runway. Airports and airfields in blue and green have published approaches.

- J5 — Jet Routes
- Special Use Airspace and Warning Areas
- Civilian Airport (Blue, Green, Brown)
- Military Airfields (Blue, Green)

Environmental Assessment for Armed Munitions Integration Testing on the Precision Impact Range Area

SPECIAL USE AIRSPACE, JET ROUTES, AND AIRPORTS UNDER ALTERNATIVES A, B, and C

DATE	FILE NO.	FIGURE NO.
4/26/04	Q238FIGURES/3-05.ai	3-5

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Air Traffic Control

The PB-13 target area lies exclusively within the Los Angeles ARTCC's boundaries (NACO 2004a). The controlling agency for the R-2515 is TRACON. During the published hours of use (identified in Table 3-6), the using agency is responsible for controlling all military activity within the special use airspace and ensuring that its perimeters are not violated. When the airspace is scheduled to be inactive, the using agency releases it back to the controlling agency (Los Angeles ARTCC), and in effect, the airspace is no longer restricted. If no activity is scheduled during some of the published hours of use, the using agency releases the airspace to the controlling agency for non-military operations for that period of inactivity (Illman 1993).

3.3 CULTURAL RESOURCES

3.3.1 Overview

Cultural resources are defined as historic properties, landscapes, cultural items, archeological resources, sacred sites, or collections subject to protection under the National Historic Preservation Act, the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, Executive Order 13007, and the *Guidelines on Curation of Federally Owned and Administered Collections* (36 CFR Part 73).

Cultural resources are locations of human activity, occupation, or use. They include expressions of human culture and history in the physical environment, such as buildings, structures, objects, districts, or other places. Cultural resources can be natural features, plants, and animals that are considered to be important to a culture, subculture, or community. Cultural resources also include traditional lifeways and practices. For this EA, cultural resources have been organized into the categories of prehistoric resources, historic resources, and traditional cultural properties and practices. These types are not exclusive and a single cultural resource may have multiple components.

Prehistoric cultural resources refer to any material remains, structures, and items used or modified by people before Euro-Americans established a presence in the region. In southern California, the earliest direct contact of native populations with Euro-Americans occurred on the coast and Channel Islands and later in inland areas. The earliest brief encounters by explorers began in the mid-sixteenth century followed by colonization and settlement by the late eighteenth century. Examples of prehistoric cultural resources recorded in the region include the archaeological remains of villages, camps, quarries, rock

shelters, rock art, milling features, cemeteries, and scatters of prehistoric artifacts, such as stone tool-making debris or groundstone artifacts.

Historic cultural resources include the material remains and landscape alterations that have occurred since the arrival of Euro-Americans in the region. Examples of historic cultural resources in the region include homestead and agricultural features, foundations, roads, buildings, scatters of historic artifacts, post-contact Native American villages, and locations or structures that are associated with the historic events or people.

Traditional cultural properties are places associated with the cultural practices or beliefs of a living community. These sites are rooted in the community's history and are important in maintaining cultural identity. Examples of traditional cultural properties include natural landscape features; places used for ceremonies and worship; ancestral villages or burial sites; places where plants are gathered that are used in traditional medicines and ceremonies; places where artisan materials are found; places where traditional arts are practiced or passed on; and features of traditional subsistence systems. Impacts to the continued use and maintenance of traditions are considered in NEPA analyses.

3.3.2 Alternatives A, B, and C

3.3.2.1 On-Base Region

Edwards AFB has the most comprehensive cultural resource identification program in the vicinity of the corridors. Over 450 archaeological surveys covering more than 134,032 acres have been completed on base. As a result of this work, 1,642 prehistoric sites, 1,269 historic sites, and 78 military sites have been recorded on base. Thirteen traditional cultural properties have been recorded (Norwood 2003).

The most common prehistoric site types are lithic scatters, temporary camps, hearth features, and milling stations. Common historic archaeological site types include refuse scatters, homestead sites, mining sites, and various agricultural features. Military resources include the sites of inactive military camps, buildings or ruins (Earle *et al*. 1997; Ronning *et al*. 2000).

Most of the archaeological sites have not been formally evaluated for the National Register of Historic Places (NRHP). Nineteen prehistoric sites and eight historic archaeological sites have been determined individually eligible for the NRHP with the concurrence of the California Office of Historic Preservation. Another seventy are considered potentially eligible and sixty-eight have been determined as not eligible

for the NRHP. There are two archaeological historic districts, one at North Base consisting of five contributing sites and one at the South Base Sled Track.

Studies of the built environment on Edwards AFB generally address military buildings and structures associated with three historic themes: World War II, the Cold War, and Man in Space. Many of the military buildings and structures on Edwards AFB are less than 50 years old and must possess "exceptional significance" to be found eligible for the NRHP. To date, 82 buildings or structures have been determined eligible. Another 29 are considered potentially eligible and 229 have been determined not eligible for the NRHP.

There are four historic building districts. Jet Propulsion Laboratory (JPL) includes 53 eligible contributing elements. Phillips Laboratory includes 5 eligible contributing elements, 27 potentially eligible structures, and 69 unevaluated structures. The South Sled Track includes 10 eligible buildings and structures. The X-15 Engine Test Complex consists of 7 eligible buildings (Norwood 2003).

Rogers Dry Lake is a National Historic Landmark and the primary resource responsible for the establishment of Edwards AFB and the Dryden Flight Research Facility. The lakebed is associated with historic aviation developments including the flight of the Bell X-1, the first plane to break the sound barrier, in 1947, and the first Space Shuttle landing, in 1981 (Earle *et al*. 1998).

3.3.2.2 Precision Impact Range Area, PB-13 Target

There are no known cultural resources at the PB-13 target site. Surveys of the West Range of the PIRA, which includes the PB-13 target site area, have identified over 136 prehistoric and historic sites. The *Phase I Cultural Resources Survey for Precision Impact Range Area (PIRA) Clean-Up* (AFFTC 1995b) describes these sites as to location, type, and mitigation measures necessary to protect the identified sites.

3.4 ENVIRONMENTAL JUSTICE AND THE PROTECTION OF CHILDREN

Executive Order (EO) 12898*, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires federal agencies to develop environmental justice strategies and make environmental justice a part of its mission by identifying and addressing disproportionately high adverse effects of its activities on minority and low-income populations. Agencies are required to ensure that their programs and activities that affect human health or the environment do not directly or indirectly use criteria, methods, or practices that discriminate on the basis of race, color, or national origin.

Executive Order 13045, *Protection of Children from Environmental Health and Safety Risks* (April 21, 1997) requires federal agencies to address the potential for disproportionately high and adverse environmental effects of their actions on children. The Order further requires federal agencies ensure that their policies, programs, activities, and standards address these risks. This document has been prepared in compliance with EO 13045 to identify and, if necessary, mitigate health and safety risks with the potential to disproportionately affect children.

The selection of the PB-13 target for Alternatives A, B, and C did not rely on or factor in the locations of minority or low-income populations or the protection of children.

3.5 GEOLOGY AND SOILS

Geologic resources consist of naturally formed minerals, rocks, and unconsolidated sediments. Soil refers to the uppermost layers of surficial geologic deposits and the weathering of those deposits. Concerns associated with the geologic setting, which could either affect or be affected by a proposed project, include topography and soil erosion on base. Normal military activities at Edwards AFB do not increase exposure to seismic hazards or other geologic hazards including landslides, subsidence, or volcanic eruption.

3.5.1 Topography

Edwards AFB is located in the Antelope Valley, a broad alluvial plain lying southwest of the Tehachapi Mountains and north of the San Gabriel Mountains. Low ranges of bedrock hills occasionally interrupt the generally flat terrain of the valley floor; the lower flanks of the hills are blanketed by Quaternary-aged alluvial fans consisting of water-laid sand and gravel deposits. The valley floor is composed of several closed topographic depressions that contain the three major playas: Rogers, Rosamond, and Buckhorn Dry Lakes. Playa deposits consist of thick, bedded clay and sand, and interfinger with the encroaching alluvial fan deposits. Playa margins have shoreline sand deposits from the wetter middle and late Pleistocene climates when the lakes were filled with water. In the lower elevations, wind-laid deposits form in the dunes and hummocks (AFFTC 2002).

The base can be characterized by having the following three physiographic regions:

- An upland area located in the northwest portion of the base north of Rosamond and west of Rogers Dry Lake. The area is characterized by low rounded hills, including Bissel and Rosamond Hills, with elevations ranging between 2,270 and 3,200 feet above MSL.

- A lowland area occupying the central and southwestern portions of the base. The lowland area includes Rosamond, Buckhorn, and Rogers Dry Lakes and the intervening area. It extends from the northern boundary of the base to the southern boundary and has a relief of approximately 400 feet, with elevations ranging from 2,270 to 2,675 feet above MSL.

- An upland area that extends east of Rogers Dry Lake to the eastern boundary of Edwards AFB. Leuhman Ridge and Haystack Butte, both over 3,400 feet above MSL are the two prominent relief features in this area. Elevations in this area range from approximately 2,400 to over 3,400 feet above MSL and are the highest of the three physiographic areas on the base.

Slope and relief on the PIRA varies from flat to gently sloping plains interspersed with broad domes and, in a few places, more resistant hills that rise sharply above the surrounding plains. Slopes range from zero percent near Rogers Dry Lake to greater than 30 percent by Kramer Hills. PB-13, located in the PIRA's West Range, is situated in an area where the slopes transition from less than one percent to one to five percent. The target has a flat, graded surface with an approximate diameter of 1,000 feet.

3.5.2 Geology

The geologic setting in the vicinity of the Edwards AFB, which is located in the western Mojave Desert region, is characterized by three major rock types or geologic complexes: a basement complex of igneous and metamorphic rocks, an intermediate complex of continental volcanic and sedimentary rocks, and valley fill deposits. The basement complex is of pre-Tertiary age and includes quartz monzonite, granite, gneiss, schist, and other igneous and metamorphic rocks. These rocks crop out in the highlands surrounding the playa areas and occur beneath the unconsolidated deposits of the playa. The intermediate complex, with limited exposure in the Edwards AFB vicinity, is of Tertiary age and includes a variety of sedimentary and volcanic rock types (Dutcher and Worts 1963).

3.5.3 Soils

The U.S. Department of Agriculture (USDA) Natural Resource Conservation Service has completed a soil survey of Edwards AFB for the U.S. Army Corps of Engineers (USACE). The *Grazing and Cropland Management Plan* for Edwards AFB describes results of this soil survey (USACE 1997). Based on this survey, the soils at Edwards AFB can be characterized as predominantly alkaline, consisting of loams, sandy loams, and loamy sands, all of which are susceptible to wind and water erosion. Soil pH values range from 7 to 8 for most soils and greater than 8 on lakebed soils. Plant growth is inhibited by

the high salinity and exchangeable sodium ion content of some soils, particularly soils in the lakebed basins (AFFTC 2002).

The *Grazing and Cropland Management Plan* (USACE 1997) identified five groups of landforms based on soil types that range from playas at the lowest elevation to hills and rock pediments. These landforms are described briefly below.

- Dry lakebeds, including Rogers Dry Lakebed, are most often covered by about 95 percent Wherry soils. These soils are deep and poorly drained, with a clay texture and slopes of 0 to 1 percent. The soil is barren with high saline and sodic content, and is subject to flooding.

- Alluvial fans in the areas surrounding the dry lakes are composed primarily of Leuhman, Norob, and Voyager soils. These soils are deep and moderately well to well drained with slopes of 0 to 5 percent. Textures are of fine sand to clay loam. The soils are saline and sodic, and subject to flooding and wind erosion.

- Dunes and sand sheets around the dry lakes are an intermediate form between the alluvial flats and the fan piedmonts. Cajon soils are dominant with smaller proportions of Challenger and other soils. Soils are deep, moderately well drained to excessively drained sands to loamy sands with slopes from 0 to 15 percent. They are subject to wind erosion.

- Fan piedmonts contain mostly Helendale soil, with smaller portions of Destazo, Lavic, Helendale Taxadjunct, and Cajon soils. These soils are deep, moderately well to well drained, loamy, coarse sands to fine sandy loams. Slopes range from 0 to 9 percent. The soils are subject to occasional flooding and wind erosion.

- Rock pediments and hills consist of Randsburg, Hi Vista, Machone, Muroc, and Sparkhule soils, interspersed with rock outcrops. These soils can be very shallow to moderately deep and are well drained, with textures of sandy loam and gravel. Slopes range from 2 to 50 percent. These soils are subject to water and wind erosion.

Alluvial sediments that surround scattered, topographically higher outcrops of granitic rock dominate the surface of the PIRA. In the immediate area of the PB-13 target site the soils are predominantly sandy loam and gravel with a slope of 1 to 5 percent.

3.5.4 Erosion

According to the *Soil Survey of Edwards Air Force Base, California, Interim Report* (USDA, Soil Conservation Service 1998) the soils at Edwards AFB are given erosion hazard ratings of slight to severe for wind erosion and slight to moderate for water erosion.

3.6 HAZARDOUS WASTE/HAZARDOUS MATERIALS

For purposes of this analysis, the terms "hazardous material" and "hazardous waste" are those substances defined by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Resource Conservation and Recovery Act (RCRA).

A hazardous material is any material whose physical, chemical, or biological characteristics, quantity, or concentration may cause or contribute to adverse effects in organisms or their offspring; pose a substantial present or future danger to the environment; or result in damage to or loss of equipment, property, or personnel.

Hazardous wastes are substances that have been "abandoned, recycled, or are inherently waste like," and that (because of their quantity, concentration, or characteristics) may cause increases in mortality or serious irreversible illness, or pose a substantial hazard to human health or environment if improperly treated, stored, transported, or disposed of.

Solid waste refers to non-hazardous garbage, refuse, sludge, and any other discarded solid material resulting from residential, commercial, and industrial activities or operations. Solid waste can be classified as construction/demolition waste, non-hazardous recyclable waste, or non-hazardous non-recyclable waste.

3.6.1 Hazardous Materials

Edwards AFB uses a wide variety of hazardous materials in support of research activities on base and its mission requirement to support all types of aircraft. Hazardous materials are used for aircraft repair and maintenance, aircraft launch and recovery, aerospace ground equipment repair and maintenance, building remodeling, and construction. Some of the most commonly used hazardous materials include jet and motor fuel, other types of petroleum products, paints, thinners, adhesives, cleaners, lead-acid batteries, hydraulic fluids, and halogenated and non-halogenated solvents (U.S. Air Force 1995).

Hazardous materials are used to support rocket propulsion research and development at the AFRL. Typical hazardous materials used include liquid and solid rocket propellants. Other hazardous materials used at the AFRL include batteries, antifreeze, cleaning/degreasing solvents, and machinery lubricants, which are used in component fabrication, repair, maintenance, and assembly operations (AFFTC 1998a).

The types of hazardous materials most commonly used during construction projects include acids, corrosives, caustics, glycol, compressed gases, paints and paint thinners, solvents, sealant, adhesives, cements, caulking, fire retardant, and hot asphalt (140^0 F or greater). Building and facility maintenance requires the use of heating fuels, paints, aerosols, and fluorescent light bulbs, all of which are hazardous materials.

Implementation of the Hazardous Materials Pharmacy approach accomplishes several important management goals, including reducing the volume of hazardous materials purchased and hazardous wastes generated through improved materials management. Edwards AFB uses the pharmacy concept to issue hazardous materials for use by Air Force personnel. The Hazardous Materials Pharmacy monitors shelf life and tracks usage of hazardous materials on base. One common database is used to manage issued hazardous material products. Hazardous materials purchased through the pharmacy are bar code labeled upon their arrival at Supply Central Receiving and distributed to the various satellite issue points or Hazardous Materials Distribution Support Centers located throughout Edwards AFB.

All organizations and contractors are required to maintain inventories of all their hazardous materials. Furthermore, organizations are required to reduce the quantity of hazardous materials used or replace them with non-hazardous material, if possible, as a part of the Pollution Prevention Program. Guidelines used by Edwards AFB include AFI 32-7086*, Hazardous Materials Management*; AFI 32-7042*, Solid and Hazardous Waste Compliance*; and AFFTC Instruction 23-1*, Hazardous Material Management Program.*

Military munitions have been used at Edwards AFB for training, research, and integration with a variety of weapons and weapon systems. These have included air-to-ground munitions deployed from aircraft and helicopters, and ground-to-ground munitions deployed on portable and vehicle-based firing systems. Munitions are also used at the small arms firing range, during explosive ordnance demolition training, and for demolition of propellants. Depending on the munition, a successful combustion will produce small quantities of by-products. Depending on the chemical, over time, small amounts may accumulate in surface soils. The EOD unit routinely detonates unexploded ordnance (UXO) during clearance activities, as detonation in place presents significantly less risk than moving UXO of unknown stability. EOD units also destroy off-specification munitions at permitted open-burning, open-detonation (OB-OD) sites. Over

the years the composition of propellants, explosive fillers, and signaling chemicals used on Edwards AFB and the PIRA has changed. Current weapon systems utilize a variety of explosive compound formulations. Table 3-7 shows eight explosive compositions, the relative percentage of common explosive compounds in each, and a general indication of the use of the compounds in existing military munitions.

The three most commonly used explosive compounds are Research Department Explosive (RDX), High Melt Explosive (HMX), and trinitrotoluene (TNT). The explosive chemicals commonly used in military munitions include 1,3-dinitrobenzene, 2,6-dinitrotoluene, 2,4-dinitrotoluene, 1,3,5-trinitrobenzene, TNT, RDX, HMX, 4-amino-2,6-dinitrotoluene, 2-amino-2,4- dinitrotoluene, 3,5-dinitroanaline, nitroglycerin, pentaerythritol tetranitrate (PETN), and nitrotoluene.

Table 3-7

Composition of Explosive Constituents in Military Munitions

		Explosive Percent				
Composition	**Use**	**TNT**	**RDX**	**HMX**	**DNT**	**Others**
Composition A	B, C, D, E		91–98			
Composition B	A, D, E, I	40	60			
Composition 4 (C4)	E, F		91			Dioctyl sebacate, Lubrizol 4837, mineral oil, polyisobutylene
Cyclotol	A, D, E, H	25	75			
HTA-3	A, B	29		49		
PBX			0–95	0–95		
Black Powder	J, K					Potassium Nitrate
Octols	A, E, H			25–35	70–75	

Notes: A - High energy projectile; B - Projectile fillers; C - Boosters; D - Grenades; E - Shaped charges; F - Demolition explosives; G - Ammunition bursting charges; H - Fragmentation charges; I - Igniter powder; J - Time fuzes

Source: U.S. Army 2003

Explosives used by EOD personnel to detonate UXO are hazardous materials. Between 50 and 150 pounds of C4 are used monthly by EOD personnel for OB/OD activities (AFFTC 1996).

3.6.2 Hazardous Waste

Hazardous materials/waste recycling is addressed in 22 California Code of Regulations (CCR) 66266.1–66266.130, Assembly Bill 3474, and the California Health and Safety Code, Section 26143.2. This includes commercial chemical products, used or contaminated solvents (halogenated, oxygenated, hydrocarbon), used or unused petroleum products, pickling liquor, unspent acids, unspent alkalis, and unrinsed empty containers of iron or steel used for pesticides or other hazardous chemicals.

The use of hazardous materials results in generation of hazardous waste (e.g., paint waste, used oil, contaminated rags), which requires proper handling. The U.S. EPA enforces the RCRA (40 CFR 260–272), which provides guidelines for the generation, storage, transportation, and disposal of hazardous waste. The California Environmental Protection Agency (Cal/EPA) enforces hazardous waste laws embodied in 22 CCR Chapters 10–20 and the California Health and Safety Code (Section 25100). Environmental Management at Edwards AFB manages hazardous waste accumulation. Guidelines used by Edwards AFB include the *Edwards Air Force Base Hazardous Waste Management Plan* (AFFTC 1998a), which was prepared in accordance with AFI 32-7042*, Solid and Hazardous Waste Compliance*. It establishes procedures to achieve compliance with applicable federal, state, and local regulations for hazardous waste management, except munitions, explosives, biohazard, and radioactive waste. Specifically, it contains requirements for solid and hazardous waste characterization, training, accumulation, turn-in and disposal, as well as procedures for inspections, permits, and record keeping.

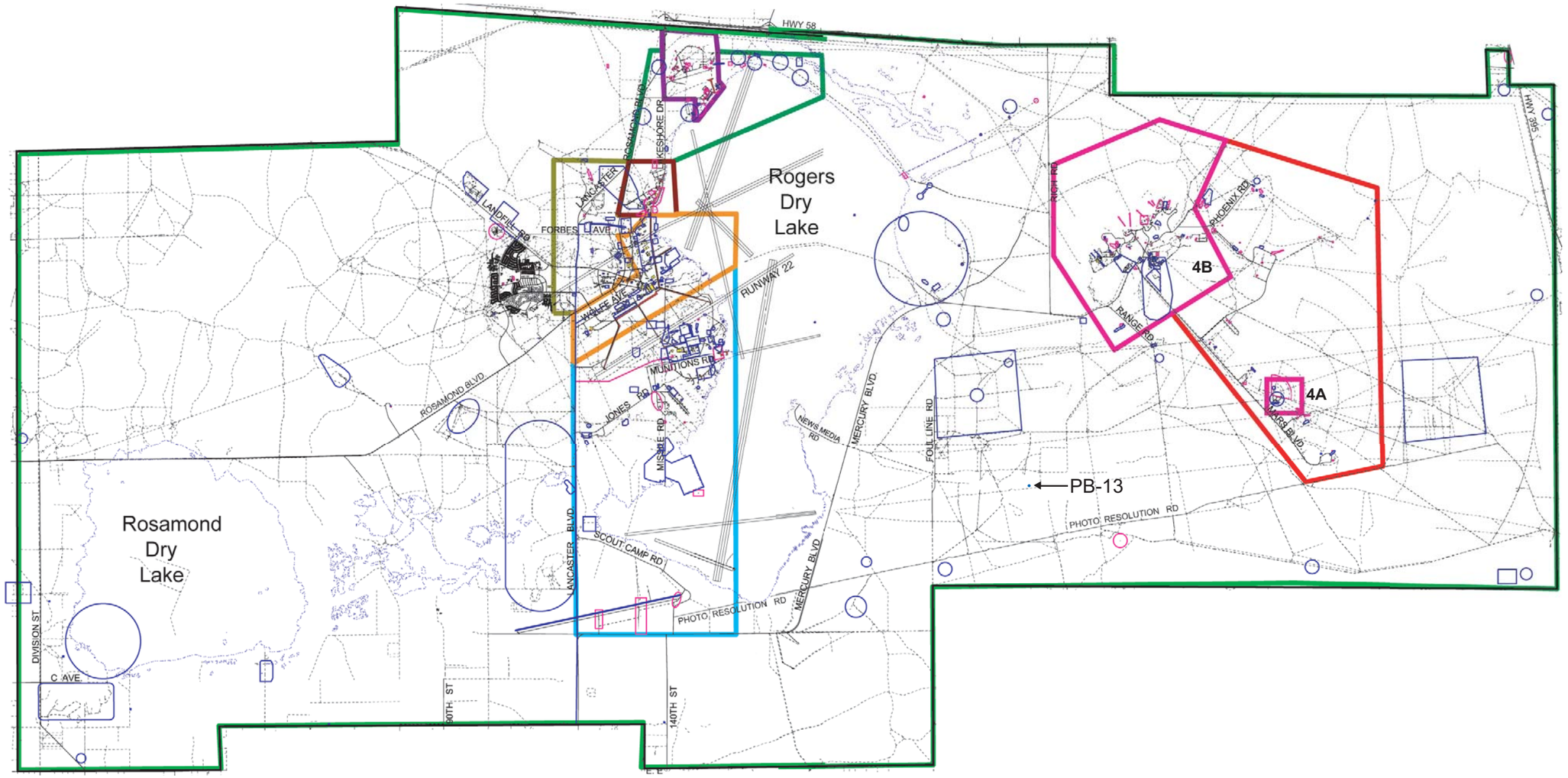
Geologic resources (i.e., soil and groundwater) are susceptible to contamination from the surface. Releases of hazardous chemicals such as petroleum products and solvents have resulted in soil contamination at military installations. Contaminated soil or groundwater may require physical removal or extensive remediation to ensure the protection of public health and safety.

The Installation Restoration Program (IRP) was established to identify, investigate, assess, and clean up hazardous waste at former disposal sites on the base in compliance with CERCLA. Under the IRP, a Preliminary Assessment was conducted at Edwards AFB to locate potential areas of concern (AOCs) that may have resulted from past activities on the 301,000-acre base.

Edwards AFB has identified 471 IRP sites and AOCs with potential contamination. The IRP sites at Edwards AFB are grouped into 10 Operable Units (OUs), generally based on geographic location. IRP sites, AOCs, and OUs are shown in Figure 3-6. Runway 22 lies within OU2, several IRP sites are located adjacent to the runway.

3.6.3 Solid Waste

Edwards AFB operates a non-hazardous (municipal solid) waste landfill within the Main Base area. At current disposal rates, the landfill is expected to reach permitted capacity in the year 2019. Due to the volume of construction/demolition waste generated on base, most current construction contracts require the contractor to dispose of such wastes at an approved off-base landfill in order to reduce the impacts to the Main Base Landfill.



LEGEND

- Unpaved Roads
- Paved Roads
- Stream and Lakes
- Taxiways
- Base Boundary
- Buildings
- AOC
- IRP Site
- PB-13 (1,000 foot diameter)

Operable Units (OUs)

- OU 1
- OU 2
- OU 3
- OU 4A
- OU 4B
- OU 5
- OU 6
- OU 7
- OU 8
- OU 9
- OU 10

0 2 4 6

SCALE IN STATUTE MILES

Environmental Assessment for Armed Munitions Integration Testing on the Precision Impact Range Area

SITES, AREAS OF CONCERN, AND OPERABLE UNITS AT EDWARDS AFB

DATE	FILENAME	FIGURE NO.
4/21/04	Q238FIGURES/3-06.ai	3-6

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The base actively participates in a recycling program, which is operated by a contractor with program oversight provided by Environmental Management. Some waste metals generated during construction and demolition projects, as well as the routine operations of various base organizations, are diverted to the Defense Reutilization and Marketing Office for resale.

3.7 INFRASTRUCTURE

Infrastructure refers to the physical components that are used to deliver something (e.g., electricity, traffic) to the point of use. Elements of infrastructure typically include energy, water, wastewater, electricity, natural gas, liquid fuel distribution systems, communication lines (e.g., telephone, computer), and circulation systems (streets and railroads).

3.7.1 On-Base Region

3.7.1.1 Energy Resources

The general policy of the Air Force regarding energy is as follows:

> Energy is essential to the Air Force's capability to maintain peacetime training, readiness, and credible deterrence; to provide quality of life; and to perform and sustain wartime operations. In short, energy is an integral part of the weapon system. The most fundamental Air Force energy policy goal is to ensure energy support to the national security mission of the Air Force in a manner that emphasizes efficiency of use, effectiveness of costs, and independence from foreign sources for mission-essential operations (AFFTC 1995).

Edwards AFB uses electricity, solar power (e.g., photovoltaic panels to run traffic lights and heat water), natural gas/propane and other petroleum-based products (gasoline, jet fuel, and diesel) as sources of energy to operate facilities, vehicles, equipment, and aircraft.

Southern California Edison provides electricity to Edwards AFB. The base uses this energy source to operate a variety of systems including lighting, heating and cooling, computers, and pumps for gas and water. Pacific Gas and Electric supplies natural gas to Edwards AFB. The base uses natural gas to run boilers, furnaces, and two standby generators. Propane is used in areas where natural gas services are unavailable and is used to operate one standby generator. Edwards AFB uses solar energy for hot water

and forced air heating systems; to provide light (i.e., skylights); and to operate the emergency phone system on major portions of Rosamond, Lancaster, and Mercury Boulevards.

Edwards AFB is responsible for approximately 13.4 miles of petroleum pipeline used to transport JP-8 jet fuel to various locations throughout the base. The supply pipeline for the base is the CalNev Pipeline. Edwards AFB receives JP-8 fuel from a spur line from the George AFB terminal.

3.7.1.2 Water Distribution System

The AFFTC purchases potable water from the Antelope Valley East Kern (AVEK) Water Agency. This water is distributed through a system located in Boron, California. The water distribution system for Edwards AFB consists of a series of pipes ranging in size from 4 to 24 inches in diameter, booster pump stations, and storage tanks. Five storage tanks, three at the Main Family Housing area and two at North Base, provide a potable water storage capacity of 4.3 million gallons. Additional storage tanks dedicated to fire suppression are located throughout the base. The distribution system, although presently adequate, requires continuous repairs and replacement to sustain its capacity (AFFTC 1997a).

3.7.1.3 Wastewater/Storm Water

There are two sanitary sewer collection and treatment systems on Edwards AFB. These systems service the Main, North, and South Base areas and the AFRL. The collection network for the existing system is composed of gravity lines, force mains, and pump stations. The Main Base Waste Water Treatment Plant provides tertiary treatment of wastewater.

The storm water distribution system at Edwards AFB consists of conveyance structures and drainage ditches (unpaved). Storm water conveyance structures include channels, gutters, drains, and sewers (not tied into the sanitary sewer system) that collect storm water runoff and direct its flow. The storm water system at Main Base conveys storm water to a pretreatment facility, which consists of an oil-water separator and an evaporation pond (AFFTC 1998b). Storm water from the undeveloped portions of the base flow into the nearest dry lake (AFFTC 1994).

3.7.1.4 Communication Systems

Communication systems on Edwards AFB include telephone, microwave, and local area networks. The distribution system for these systems generally consists of copper-pair cable, fiber-optic cable, and a communication manhole/conduit system.

3.7.1.5 Transportation Systems

Edwards AFB is accessed by way of Rosamond Boulevard from the west or north, and by Lancaster Boulevard/120th Street East from the south. Primary access to Edwards AFB from the adjacent roadways is by way of North Gate, West Gate, and South Gate, each of which is in operation 24 hours a day, 7 days a week. All gates contain two inbound and two outbound lanes (USACE and AFFTC 1994).

Internal circulation on base is by way of paved and unpaved primary, secondary, and tertiary roads. Primary roads connect Edwards AFB components such as the flightline, Engineering and Administration, and support areas to entry points. Secondary roads connect Edwards AFB components to one another and support facilities such as commercial or housing areas. Tertiary roads are unpaved access roads or residential streets within the housing area (AFFTC 1997b).

The primary base streets currently carry all rush-hour traffic without significant congestion problems. The traffic flow at the West Gate is approximately 5,300 vehicles daily or 40 percent of total base traffic volume. The South Gate has a traffic flow of approximately 4,600 vehicles daily or 34 percent of the total base traffic volume. The North Gate services approximately 3,500 vehicles daily or 26 percent of the total. The West Gate provides the best free flow during morning rush-hour traffic, while the South and North Gates allow sufficient flow without exceeding design capacity.

Traffic consists of government, contractor, and privately owned vehicles belonging to those who live and/or work on base. In addition, commercial vehicles deliver material to businesses and facilities in the area. Commercial and Air Force vehicles are used for service and construction work done in the area. Emergency vehicles require access to all buildings and roads. In addition to the paved roadways, an extensive network of unimproved, dirt roadways exists, essentially equivalent to the paved network. These roads have posted speed limits and provide access to various installation facilities and sites.

Two railroads are adjacent to the base. The Southern Pacific line runs parallel to the base's west boundary and adjacent to Sierra Highway. The north/south main line does not provide service to Edwards AFB. The Atchison, Topeka, and Santa Fe Railroad is located south of California Highway 58 and along the northern boundary of the Base. Two rail spurs, one at Edwards Station and the other at Boron Station connect to the Main Base and AFRL, respectively (AFFTC 1994).

3.7.2 Precision Impact Range Area, PB-13 Target

The infrastructure supporting the PB-13 target area is a subset of the on-base area.

3.8 LAND USE

Land use is described for Edwards AFB and the PIRA including a description of the visual and aesthetic resources. Land may be used for a variety of purposes including residential, industrial, commercial, agricultural, recreational, and military. Specialized land uses may include radio transmission areas, bombing/missile ranges, wildlife preserves, explosive ordnance ranges, and airfields.

3.8.1 Edwards AFB

Edwards AFB is situated in Kern, Los Angeles, and San Bernardino Counties, approximately 60 miles northeast of the city of Los Angeles. The base lands are classified and managed using three land categories: improved, semi-improved, and unimproved. Approximately 290,957 acres of largely undeveloped or semi-improved land are used to support flight-testing of a wide variety of military, civilian, and experimental aircraft. Unimproved lands comprise 95.3 percent of total base lands; semi-improved lands account for about 1.5 percent of the total, and improved land accounts for about 3.2 percent. Semi-improved lands include areas that are generally located in proximity to airfields, runways, test facilities, parking ramps, fence lines, some recreational areas, and relatively undeveloped areas such as open storage areas (AFFTC 2002).

The developed portion of the base is concentrated on the west side of Rogers Dry Lake. It includes clear areas around test facilities and improved runways (AFFTC 2002). Developed areas include Main Base, North Base, South Base, Family Housing areas, and the AFRL. The *Edwards Air Force Base Comprehensive Plan* describes long-range development for Edwards AFB, establishing goals, policies, plans, and anticipated action regarding the physical, social, and economic environment (AFFTC 1994). Land use designations, including total acreage and percent of the base area, are described in Table 3-8 (AFFTC 1994).

Within these various land use categories, specific areas have been designated for a particular purpose. These include, but are not limited to, the off-road vehicle areas I and II, the Combat Arms Range, hunting and fishing areas, the PIRA, and the AFRL.

A portion of Edwards AFB is designated for the NASA Dryden Flight Research Center (DFRC), which is a major installation on base, covering 838 acres. DFRC's existing land-use plan divides its facility into three basic use zones: (1) the flightline, (2) support services, and (3) explosive hazard zones. The flightline zone is adjacent to Rogers Dry Lake, is restricted to flight research activities, and includes aircraft hangars, test facilities, pavement, and runways. Support services are behind the flightline zone

and include warehouses, project support complexes, and administrative support. Western Aeronautical Test Range zones include a remote site and a small triangular section of the facility adjacent to Lily Avenue that includes a radio tower. The remote site includes the facility's water tower and several radio towers. The two explosive hazard zones overlap the flightline and support services zone. These two circular zones extend for a minimum distance of 1,200 feet from the shuttle loading area (NASA 1999).

Table 3-8

Land Use Designations at Edwards AFB

Land Use Designation	Total Square Miles	Total Acres	Percentage of Total Base Property (%)
Aircraft Clearance, Quantity-Distance	4.86	3,110.40	1.00
Aircraft Pavement, Runways	0.91	582.40	0.20
Lakebed Painted Runways	3.12	1,996.80	0.070
Lakebed Non-maintained Landing Site	61.00	39,040.00	13.00
Aircraft Operations and Maintenance	0.2	128	0.04
Engineering Test	27.83	17,811.20	5.90
Aircraft Test Ranges	336.23	215,187.20	71.50
Industrial	12.18	7,795.20	2.60
Administrative	0.19	121.60	0.04
Community Commercial	0.21	134.60	0.04
Community Service	0.30	192.00	0.10
Medical	0.07	44.80	0.01
Housing	1.52	972.80	0.30
Outdoor Recreation	3.83	2,451.20	0.80
Buffer Zone	17.75	11,360.00	3.80
Water	0.00	0.00	0.00
Total[1]	**470**	**300,800**	**100**

Note: 1- rounded to the nearest whole number

3.8.1.1 Land Use Restrictions

Air Force land use policies and guidance are only applicable to lands under their control. Policies established by the Air Force for airfields are similar to the criteria established by the FAA for development of surrounding civilian airports. Air Force Joint Manual 32-1013, *Airfield and Heliport Planning and Design Criteria,* sets the minimum requirements for airfields and applicable land uses for surrounding areas. As part of the review and approval process, the Edwards AFB Planning and Zoning Committee grants final siting approval for all construction and activity-related projects. Edwards AFB has three paved runways that provide the principal landing surfaces for the base. These runways are divided into two different classes: A and B. The primary difference between class A and B runways is in the type of aircraft used on the runway. Class A runways are primarily intended for small, light aircraft. Class B runways are primarily intended for high performance and large, heavy aircraft. The Main Base Runway

(Runway 22) is a class B runway and is the primary airstrip on base. The runways North and South Base are class A. In addition, the base has 18 runways painted on dry lakebeds and uses the remaining lakebed areas for emergency landings.

Land use controls around airfields and lakebeds are recommended by the air installation compatible use zone (AICUZ). The AICUZ delineates areas at both ends of a runway, called accident potential zones (APZs), where the probability of aircraft accidents is highest based on statistical analysis of past accident data at various bases.

A clear zone is an area on the ground or water beginning at the end of the runway and symmetrical about its center. This zone is to be free of obstacles for the purpose of protecting the safety of approaching aircraft. The clear zone for a class A runway is 1,000 feet wide by 3,000 feet long. The clear zone for a class B runway is 3,000 feet wide by 3,000 feet long.

Accident potential zones I and II, located beyond the clear zone, possess a significant potential for accidents. Each zone has associated land use restrictions and its size is dependent upon a variety of factors defined in Air Force Joint Manual 32-1013, *Airfield and Heliport Planning and Design Criteria*. The following land uses are generally compatible with APZ 1: industrial, agricultural, recreational, and vacant land. In addition to compatibility with APZ I land uses, APZ II also includes low-intensity residential and nonresidential uses for a maximum of 20 percent building coverage per acre.

Explosive hazard or quantity-distance zones are associated with test areas and areas for explosives, munitions, and propellant storage. These zones vary in size depending upon the quantity and type of explosive being used or stored. Zoning ensures the safety of all personnel within a given area. Typical areas where these zones exist include the unconventional fuels area, the explosive ordnance disposal area, the gun-butt and munitions storage area, the arm/de-arm areas, the hot cargo area, the PIRA, and the AFRL. The ROI for the proposed action includes all explosive hazard and quantity distance zones on base, as well as those required in the immediate vicinity of PB-13 for the proposed weapons delivery testing.

Numerous active and inactive areas have been used for conventional ordnance. Figure 3-7 shows the land uses for targets that have been historically used or are currently in use throughout the base. Target rings indicate a circular error of 50 percent, meaning that if the radius of the target is 1 mile, 50 percent of the bombs are expected to fall in this defined area.

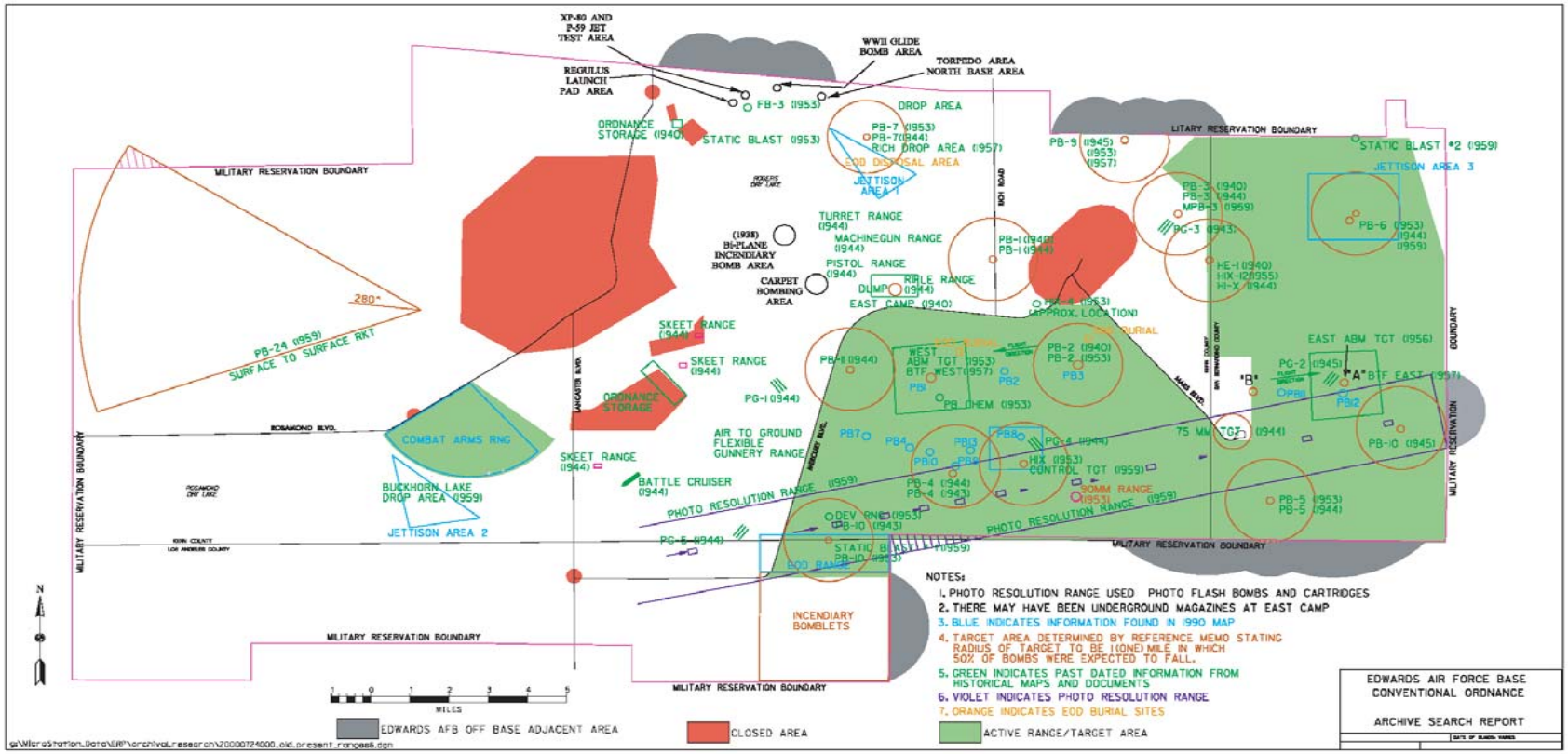

Figure 3-7 Historic and Current Uses of the PIRA

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3.8.1.2 Airfield Operations

Flightline operations are carried out by the 412 TW and the 95th Air Base Wing (95 ABW). The 412 TW is the direct mission organization of the AFFTC, which is responsible for testing and evaluating manned and unmanned aerospace vehicles, subsystems, and components. The 95 ABW is the

support unit on Edwards AFB responsible for communications; civil engineering; transportation, including loading and unloading armament and supplies; fuel supply; security police; and fire protection.

The 412th Operations Group (412 OG) plans and conducts all flight test activities for the 412 TW. The 412 OG also advises the 412 TW on air traffic control matters and airfield and airspace management including flight management. Ridley Mission Control Center is the central safety coordination point for all operations affecting the PIRA.

3.8.2 Land Use on the PIRA

The *Edwards Air Force Base Comprehensive Plan* (BCP), adopted in June 1994, characterizes the PIRA as an aircraft test range (AFFTC 1994). This land use category includes all test ranges at Edwards AFB.

The PIRA has a quantity distance zone, which is a safety zone located around the EOD Range areas. The use of the PIRA as a bombing range precludes the use of the area for recreational uses (e.g., off-road vehicle, hunting, horseback riding, camping or other recreational uses) due to the hazardous situations found on the PIRA (e.g., unexploded ordnance, laser use, and bombing).

The *Edwards Air Force Base Joint Land Use Study* was prepared as part of the base's planning and coordination efforts with local and regional planning agencies (Edwards AFB 1996). The study included four land use categories associated with the base and its operations: Edwards AFB, flight corridors, spin areas, and buffer areas. The only land use category directly related to PIRA operations is the buffer areas. A buffer area of not less than 2 miles has been extended around the base and is divided into the Northwest Buffer Area and the Southeast Buffer Area. The Buffer Area Policy allows the base to minimize the potential for impacting new land uses within this 2-mile area, while enabling the base to adapt to the needs of future AFMC programs (Edwards AFB 1996).

3.8.2.1 Visual and Aesthetic Resources

A Scenic Quality Map for Edwards AFB, created by the Bureau of Land Management Visual Resource Management Program, divides the base into sub-units and rates them according to the following factors:

landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modification. Class A areas contain a combination of the most outstanding characteristics of each rating factor. There are no Class A areas on base. Class B areas contain a combination of some outstanding features and features fairly common to the physiographic region. Areas with lakebeds, the more scenic and relatively undisturbed hills and ridges, the denser Joshua Tree woodlands, and Leuhman Ridge on base fall into Class B. Class C areas contain features fairly common to the physiographic region and include the remainder of the base, with the exception of the developed areas. Class D areas are so heavily developed and/or extensively disturbed that they lack positive aesthetic attributes, thereby diminishing the visual quality of surrounding areas. These areas include North Base, JPL, NASA, Main Base, South Base, housing, and the AFRL (AFFTC 1994).

Class B areas can be found primarily through the central part of the PIRA, from Mercury Boulevard to U.S. Highway 395. Class C areas can be found primarily along the northern, southern, and southeastern boundaries of the PIRA (AFFTC 1996). Landforms on the PIRA consist of claypans, edge playas, flat to rolling terrain, and scattered rugged hills and ridgelines. Unique visual resources on the PIRA include the following:

- Mount Mesa complex, located on the southwest portion;
- Jackrabbit Hill and surrounding ridges that mark the southern boundary;
- Red Buttes, located in the southeast portion;
- Kramer Hills on the east boundary; and
- The flat plains that make up the West, East, and PB-6 Ranges.

The PIRA is relatively devoid of manmade objects with the exception of the graded areas for the West Range and buildings painted white (e.g., Phillips Laboratory water system, instrumentation and observation buildings). The PIRA contains both Class B and C areas, in approximately equal proportions.

Edwards AFB contains two areas with special ecological concerns: desert tortoise critical habitat, and Significant Ecological Areas (SEAs). These areas are discussed further in Section 3.9, Natural Resources.

3.9 NATURAL RESOURCES

Biological resources are defined as terrestrial and aquatic ecosystems with the native plants and animals that occur throughout these ecosystems. This includes plant populations and communities; wildlife populations and their relationship to habitat; and aquatic habitat, and riparian ecosystems. Plant and

animal species that are proposed for, candidates for, or are listed as, threatened or endangered by the USFWS, and species having equivalent status at the California state level, are referred to as special-status species and are given special consideration by law for their preservation.

Critical habitat for a threatened and endangered species is defined under the federal Endangered Species Act (ESA) as specific areas within the geographical area occupied by the species at the time it is listed that contain the physical or biological features that are essential to the conservation of the species and may require special management considerations or protection, and specific areas outside the geographic area occupied by the species at the time it is listed that are also essential to the conservation of the species.

The USFWS identifies primary physical and biological constituent elements of an area designated as critical habitat that are essential to the conservation of the species (50 CFR 424.12). Primary constituent elements may include, but are not limited to, roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetlands or drylands, water quality or quantity, host species or plant pollinators, geological formations, vegetation types, tides, and specific soil types (50 CFR 424.12).

Federal agencies are required by Section 7 of the ESA to assess the effect of any project on federally listed threatened and endangered species. Under Section 7, consultation with the USFWS is required for federal projects if such actions could directly or indirectly affect listed species or destroy or adversely modify critical habitat; a conference is required if such action could directly or indirectly affect a proposed listed species or proposed critical habitat. It also is Air Force policy to follow management goals and objectives specified in Integrated Natural Resource Management Plans, and to consider sensitive species, sensitive communities, and habitats recognized by state and local agencies when evaluating impacts of a project.

3.9.1 Plants

3.9.1.1 Plant Communities

The five major plant communities at Edwards AFB are creosote bush scrub, Joshua tree woodland, halophytic phase saltbrush scrub, xerophytic saltbrush scrub, and mesquite woodland (Figure 3-8). The PIRA contains four of these plant communities not including the lakebeds, claypans, and dunes. The West Range consists of halophytic phase saltbrush scrub, creosote bush scrub, and Joshua tree woodland. Target PB-13 is cleared of vegetation.

Creosote bush scrub is dominated by creosote bush (*Larrea divaricata*). At Edwards AFB, there are approximately 103,000 acres of creosote bush scrub, which comprises approximately 34 percent of the base area. Creosote bush scrub is distributed throughout the northwestern and eastern portions of the base and supports the highest plant diversity on base (AFFTC 2002). Common species found in this community include winterfat (*Ceratoides lanata*), cheesebush (*Hymenoclea salsola*), and Nevada tea (*Ephedra nevadensis*).

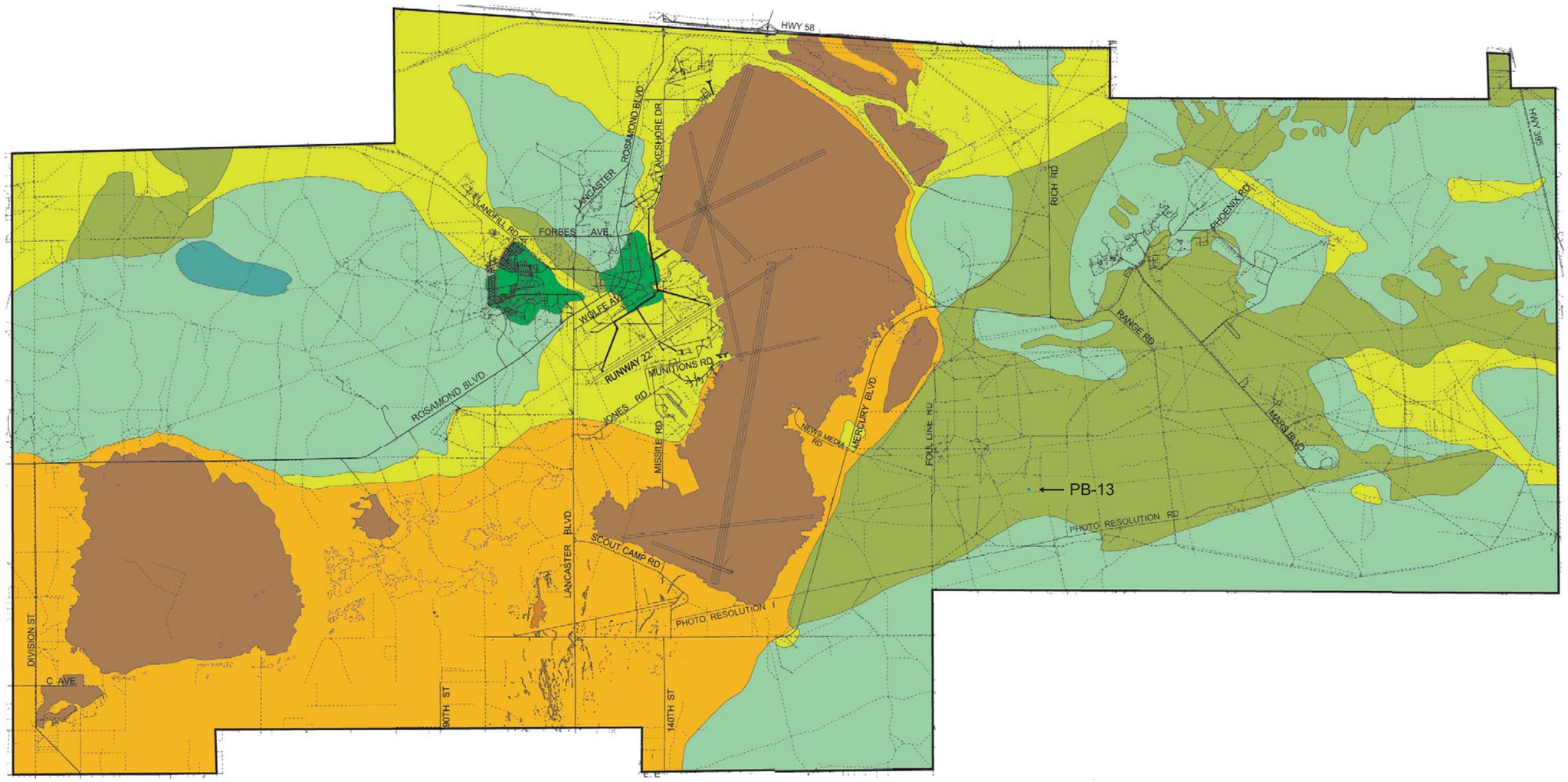
Joshua tree woodland is dominated by Joshua trees (*Yucca brevifolia*) and is most prevalent east of Rogers Dry Lake, with small patches occurring in the northwest. At Edwards AFB, there are approximately 52,800 acres of Joshua tree woodland, which comprises approximately 17 percent of the area of the base. Common species found in this community include the native desert dandelion (*Malacothrix glabrata*), pincushion (*Chaenactis* sp.), and fiddleneck (*Amsinckia tesselata*).

Halophytic phase saltbrush scrub is dominated by four species of the genus *Atriplex*: spinescale (*A. spinifera*), shadescale (*A. confertifolia*), four-wing saltbush (*A. canescens*), and quailbush (*A. lentiformes*). At Edwards AFB, there are approximately 55,300 acres of halophytic phase saltbush scrub, which comprises approximately 18 percent of the area of the base. A common species found in this community includes saltgrass (*Distichlis spicata*).

Arid phase saltbrush is dominated by allscale (*Atriplex polycarpa*). At Edwards AFB, there are approximately 45,300 acres of arid phase saltbush scrub, which comprises approximately 15 percent of the area of the base. Common species found in this community include burrobush (*Ambrosia dumosa*), goldenhead (*Acamptopappas sphaerocephalus*), and cheesebush (*Hymenoclea salsola*).

3.9.1.2 Sensitive Plant Species

Studies of sensitive plants at Edwards AFB indicate that no federal or state-listed plant species have been identified on base. Nine species that are listed by the California Native Plant Society (CNPS), however, have been identified on base. Four of these plants are Barstow woolly sunflower (*Eriophyllum mohavense*), desert cymopterus (*Cymopterus deserticola*), alkali mariposa lily (*Calochortus striatus*), and yellow spiny cape (*Goodmania luteola*). The desert cymopterus is presently under a 12-month review by the USFWS for listing under the ESA (USFWS 2004). The alkali mariposa lily and desert cymopterus are known to occur on the PIRA (Edwards AFB 1996). Two populations of the alkali mariposa lily have been found south of Avenue B in the northwest corner of the Mount Mesa Complex. Populations of the desert cymopterus are generally located northwest of Haystack Butte, southwest of Haystack Butte,



Legend

- Unpaved Roads
- Paved Roads
- Taxiways
- Base Boundary

Habitats and Plant Communities

- Xerophytic Saltbush Scrub
- Urban/Developed Areas
- Playa
- Mesquite Woodland
- Joshua Tree Woodland
- Halophytic Saltbush Scrub
- *Hymenoclea-Lycium* Scrub
- Creosote Bush Scrub

● PB-13 (1,000 foot diameter)

N

0 2 4 6

SCALE IN STATUTE MILES

Environmental Assessment for Armed Munitions Integration Testing on the Precision Impact Range Area

HABITATS AND EIGHT PLANT COMMUNITIES AT EDWARDS AFB

DATE	FILENAME	FIGURE NO.
6/10/04	Q238/FIGURES/3-08.ai	3-8

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northwest of the Downfall Complex, southwest of Kramer Hills, and north of Red Buttes along the eastern boundary of the PIRA. Due to heavy rainfall that occurred during the 1994/1995 rainy season, these plants can now be found throughout the East and West Range, Haystack Butte, Jack Rabbit Hill, and other sites on the PIRA (Edwards AFB 1996).

3.9.2 Wildlife

Five eubranchiopod shrimp species have been identified in Rogers Dry Lake: clam shrimp (*Eocyzicus digueti*), tadpole shrimp (*Lepidurus lemmoni*), and three species of fairy shrimp (*Branchinecta mackini*, *B. gigas*, and *B. lindahli*) (AFFTC 1992). Eubranchiopods lie dormant in the soil of dry lakebeds until flooding creates the aquatic habitat necessary to complete their life cycles. These shrimp are a food source for a variety of migratory shorebirds that congregate at Rogers Dry Lake when water is present.

To date, the only amphibians identified on base include the western toad (*Bufo boreas*), Pacific tree frog (*Hyla regilla*), red-spotted toad (*Bufo punctatus*), and African clawed frog (*Xenopus laevis*). These were identified at Piute Ponds by U.S. Geological Survey biologists during a survey in 1997. The African clawed frog is a problematic introduced species that feeds on native wildlife, including other amphibians, small reptiles, and fish (AFFTC 1997c). Common reptiles on base include the desert spiny lizard (*Sceloporus magister*), side-blotched lizard (*Uta stansburiana*), western whiptail *(Cnemidophorus tigris)*, zebra-tailed lizard (*Callisaurus draconoides)*, glossy snake (*Arizona elegans*), coachwhip (*Masticophis flagellum*), gopher snake (*Pituophis melanoleucus*), and the Mojave green rattlesnake (*Crotalus scutulatus*).

Common birds include the turkey vulture (*Cathartes aura*), common raven (*Corvus corax*), sage sparrow (*Amphispiza belli*), barn owl (*Tyto alba*), house finch (*Carpodacus mexicanus*), and western meadowlark (*Sturnella neglecta*). Joshua tree woodlands support cactus wren (*Campylorhynchus brunneicapillus*) and ladder-backed woodpecker (*Picoides scalaris*). Common bird species found in creosote scrub include the horned lark (*Eremophila alpestris*), black-throated sparrow (*Amphispiza bilineata*), and sage sparrow. The seasonal inundation of lakebeds and claypans attracts wading bird species, including the black necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), and greater yellowlegs (*Tringa melanoleuca*). Birds associated with ponds include the yellow-headed blackbird (*Xanthocephalus xanthocephalus*), black-crowned night heron (*Nycticorax nycitorax*), and green heron (*Butorides striatus*).

Horned larks are commonly found in open habitat with sparse vegetation or areas of low shrubs (i.e., open field, agricultural areas, desert habitat, prairies, and grassland communities). The main runways on base are surrounded by arid phase saltbush scrub. Combined with open areas along the flightline, this habitat is

suitable for horned larks. The vegetation adjacent to the runways is periodically graded, creating a buffer area devoid of vegetation, which also provides additional foraging habitat for horned larks. Methods that have been used at Edwards AFB to control the bird airstrike problem with horned larks include revegetation with native plants and use of a falconer.

The storm water retention pond along the flightline attracts other types of birds (e.g., waterfowl and shorebirds) and possibly bats associated with aquatic habitats. Barn owls (*Tyto alba*) are known to inhabit buildings on the flightline. During the evening, owls feed on small rodents adjacent to the runways and in other areas nearby.

Common mammals on Edwards EFB include the black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audobonii*), and coyote (*Canis latrans*). Common rodents include the deer mouse (*Peromyscus maniculatus*), grasshopper mouse (*Onychomys torridus*), little pocket mouse (*Perognathus longimembris*), Merriam's kangaroo rat (*Dipodymus merriami*), and desert woodrat (*Neotoma lepida*). Common bats include the western pipistrelle (*Pipistrellus hesperus)*, and little brown bat (*Myotis lucifugus*).

3.9.3 Sensitive Wildlife Species

The desert tortoise is listed as threatened by the federal government and by the State of California. It can occur throughout the Colorado and Mojave deserts in elevations up to 4,100 feet, although ideal habitat typically occurs between 1,000 and 3,000 feet (Edwards AFB 2001). The desert tortoise can occur in almost every desert habitat, but is most common in desert washes, desert scrub, creosote bush, and Joshua tree habitats. This species finds cover in burrows that are usually under bushes and requires loose, dry, sandy soil for nest building. The desert tortoise is a herbivorous reptile whose native range includes the Sonoran and Mojave deserts of southern California, southern Nevada, Arizona, extreme southwestern Utah, and Sonora and northern Sinaloa, Mexico.

3.9.4 Migratory Birds

Seasonal migratory birds use both permanent and temporary bodies of water for foraging on shrimp and other food items at Edwards AFB. These birds include ducks and geese such as the ruddy duck (*Oxyura jamaicensis*), northern mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), Canada goose (*Branta canadensis*), and snow goose (*Chen caerulescens*). Ducks and geese are hunted in designated areas on base.

3.9.5 Sensitive Habitats

Sensitive habitats at Edwards AFB include but are not limited to designated critical habitat for the desert tortoise, sensitive plant populations (Section 3.9.1.2), and SEAs as defined by the County of Los Angeles. The sensitive habitats discussed below are ones most relevant to the Proposed Action and Alternatives.

3.9.5.1 Designated Critical Habitat

In 1994, the USFWS designated portions of the base as desert tortoise critical habitat (USFWS 1994). Approximately 65,000 acres of the base fall within the Fremont-Kramer Desert Tortoise Critical Habitat Unit that includes portions of the PIRA, AFRL, and the Mount Mesa area (Figure 3-9).

3.9.5.2 Desert Tortoise Management Zones

In 1994, the USWFS issued a Biological Opinion for the PIRA that created three Desert Tortoise Management Zones corresponding with mission use in each zone (Edwards AFB 1996). Desert tortoise critical habitat (see Section 3.7.5) is present within the PIRA desert tortoise management zones; however, the zones extend beyond critical habitat areas. Target PB-13 is located in Zone 1, which corresponds to the highest use area with respect to operations at the PIRA. Activities within Zone 1 are not expected to preclude the recovery of the desert tortoise in the Western Mojave Desert. Moderate desert tortoise densities are expected in Zone 2. Zone 3 contains a minimal amount of PIRA support infrastructure and is expected to have minimal improvements and activities. Zone 3 provides the greatest level of protection for desert tortoises because of the high population density of desert tortoises that can be found there.

3.9.5.3 Significant Ecological Areas

The County of Los Angeles General Plan establishes 61 SEAs, which represent a wide variety of biological communities within the county. The SEAs function to preserve this variety to provide a level of protection to the resources within them. The SEAs are intended to be preserved in an ecologically viable condition for the purposes of education, research, and other non-disruptive outdoor users, but are not intended to preclude limited compatible development.

Los Angeles County has identified two SEAs on Edwards AFB: Edwards AFB (SEA #47) and Rosamond Lake (SEA #50). The locations of these SEAs are shown on Figure 3-9. SEA #47 contains botanical features that are unique and limited in distribution in Los Angeles County. They include the only good stands of mesquite (*Prosopis glandulosa*) in Los Angeles County. The area contains fine examples of creosote bush scrub, alkali sink, and the transition vegetation between the two. Mesquite woodlands

provide habitat for a variety of mammals, birds, and reptiles. The best example of shadscale scrub and alkali sink biotic communities in Los Angeles County are in SEA #50. It also contains Piute Ponds, which are located in the southwestern corner of the base. Piute Ponds support a variety of wildlife, especially birds. An important aspect of these ponds is that they provide a stopover area for migratory birds.

3.10 NOISE AND VIBRATION

3.10.1 Noise Characteristics

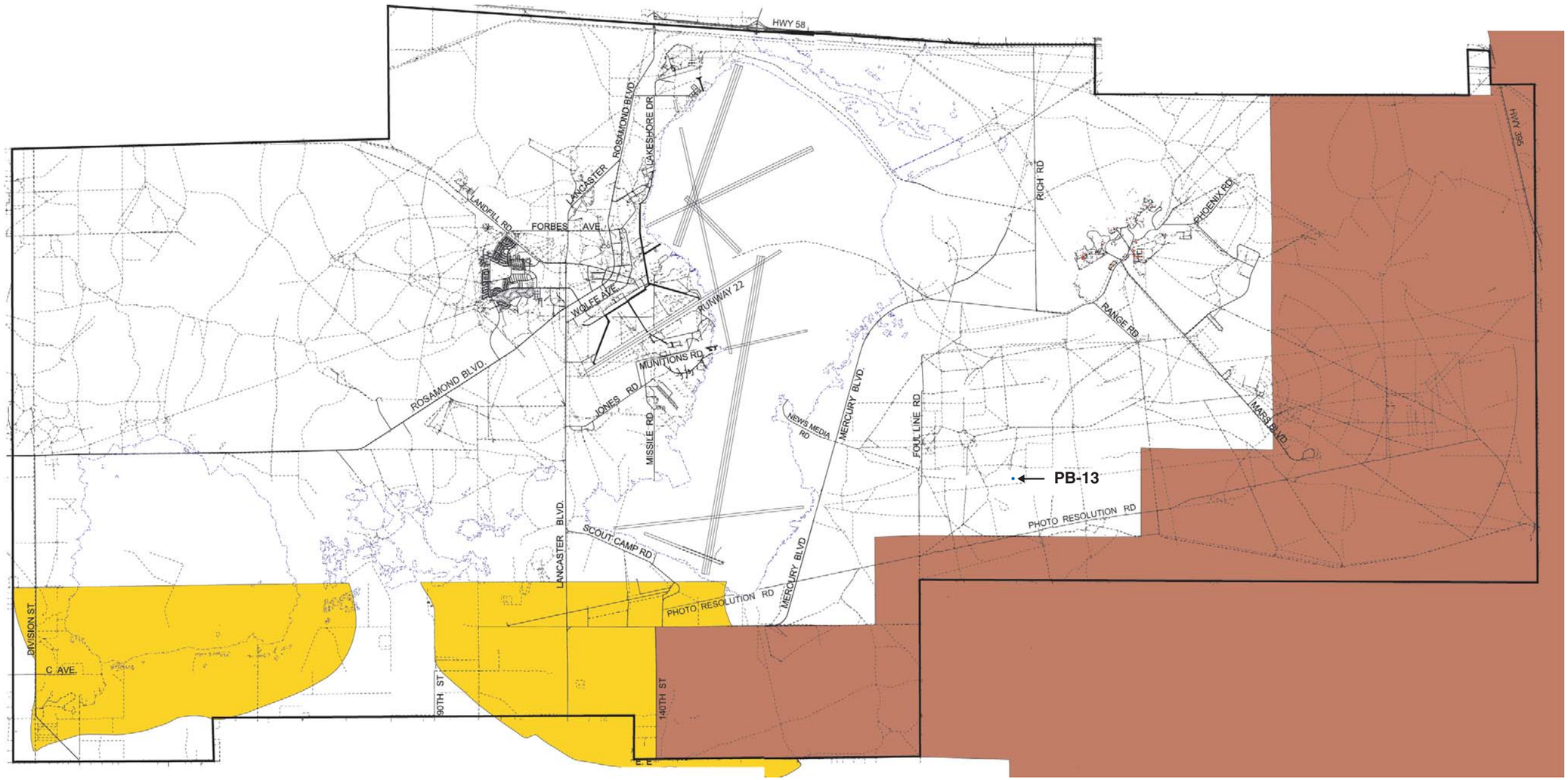
In 1972, Congress enacted the Noise Control Act (NCA), Public Law 92-574. Among the requirements under NCA was a directive to the U.S. EPA to "…publish information on the levels of environmental noise, the attainment and maintenance of which in defined areas under various conditions as requisite to protect the public health and welfare with an adequate margin of safety." The U.S. EPA published EPA-550/9-47-004, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, in 1974 (Levels Document).

The characteristics of sound include parameters such as amplitude, frequency, and duration. The decibel (dB), a logarithmic unit that accounts for the large variations in amplitude, is the accepted standard unit measurement of sound. Different sounds may have different frequency content. When measuring sound to determine its effects on the human population, A-weighted sound levels (dBA) represent adjusted sound levels. The adjustments, created by the American National Standards Institute (1983), are established according to the frequency content of the sound. Examples of typical A-weighted sound levels are shown in Figure 3-10.

Noise is usually defined as sound that is undesirable because it interferes with communication and hearing, is intense enough to damage hearing ability, or is otherwise annoying. Noise levels often change with time. Therefore, to compare levels over different time periods, several descriptors were developed to account for the time variances.

These descriptors are used to assess and correlate the various effects of noise on humans, including land use compatibility, sleep and speech interference, annoyance, hearing loss, and startle effects.

- A-weighted decibel scale (dBA). This scale simulates the range of sound that is audible by the human ear. The A-weighted scale significantly reduces the measured pressure level for low frequency sounds while slightly increasing the measured pressure levels for



Legend

- Unpaved Roads
- Paved Roads
- Taxiways
- Base Boundary
- **PB-13 (1,000 foot diameter)**

Sensitive Wildlife Habitat

- Desert Tortoise Critical Habitat
- Los Angeles County Significant Ecological Area (SEA)

N

0 2 4 6

SCALE IN STATUTE MILES

Environmental Assessment
for Armed Munitions Integration Testing
on the Precision Impact Range Area

TWO SENSITIVE WILDLIFE HABITAT AT EDWARDS AFB

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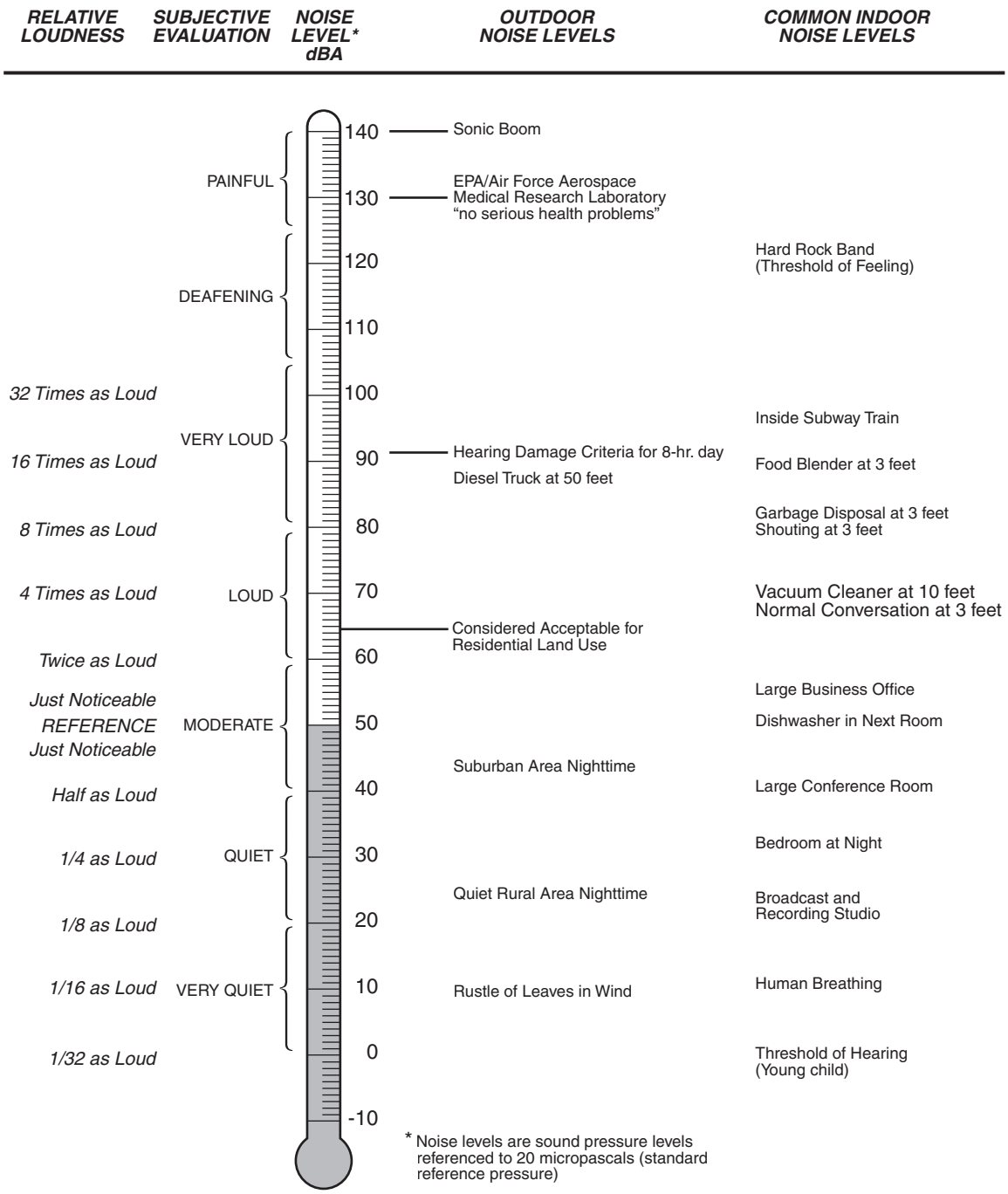
Figure 3-10 Examples of Typical A-Weighted Sound Levels



(SOURCE: U.S. Air Force 1975, 1978, no date [n.d.])

Environmental Assessment for Armed Munitions Integration Testing on the Precision Impact Range Area

EXAMPLES OF TYPICAL A-WEIGHTED SOUND LEVELS

DATE	FILENAME	FIGURE NO.
4/21/04	Q238/FIGURES/3-10.ai	3-10

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middle frequency sounds. A-weighted sound levels are typically measured between 1,000 to 4,000 hertz (Hz).

- The long-term equivalent A-weighted sound level (Leq). This describes time-varying noise energy as a steady noise level.

- Day-night average noise level (DNL). The DNL, often referred to as L_{dn}, has been adopted by federal agencies as the standard for measuring noise. The DNL is an A-weighted, 24-hour average of hourly averages. Each hourly average represents the sound energy of all the disparate sounds that occurred during that hour. The hourly average would be a continuous, uniform sound whose total sound energy would be equal to the sum of the individual sound energies of all the real sounds occurring during that hour. Typically, different hours of the day would have different hourly averages. For this reason, and for standardization, the DNL is defined as the average of the 24 hourly averages of the day.

- C-weighted sound level. C-weighting measures sound levels in dB, with no adjustment to the noise level over most of the audible frequency range except for a slight de-emphasis of the signal below 100 Hz and above 3,000 Hz. C-weighting is used as a descriptor of low-frequency noise sources, such as blast noise, explosive detonations, and sonic booms.

- C-weighted day-night level (CDNL) is the C-weighted sound level averaged over a 24-hour period, with a 10-dB penalty added for noise occurring between 10:00 p.m. and 7:00 a.m. CDNL is similar to DNL, except that C-weighting is used rather than A-weighting. CDNL is used to evaluate human response or annoyance to noise sources, such as blast noise and sonic booms.

- Sound exposure level (SEL) considers both the A-weighted sound level (AL) and duration of noise. SEL converts the total A-weighted sound energy in a given noise event with a given duration into a 1-second equivalent and, therefore, allows direct comparison between sounds with varying intensities and durations.

- C-weighted sound exposure level (CSEL) is an SEL measurement based on the C-weighted level rather than the A-weighted level.

- Sound pressure level (SPL) is a logarithmic scale, using dB as units, and a reference pressure that corresponds approximately to the minimum audible sound pressure.

- Community noise equivalent level (CNEL) has been adopted by the State of California as the descriptor for measuring noise levels. The CNEL is similar to the DNL, except that it includes a 5 dB penalty for evening noise (7:00 p.m. to 10:00 p.m.) in addition to the 10 dB "penalty" for nighttime noise.

In the Levels Document, the U.S. EPA reported that the best metrics to describe the effects of environmental noise in a simple, uniform, and appropriate way were:

- The Leq; and

- The DNL or L_{dn} (a variant of Leq that incorporates a 10-dB "penalty" for nighttime noise).

Another factor that describes how noise is characterized and analyzed is whether the noise source is continuous or impulsive. Continuous noise sources are from highways, construction sites, and cities with heavy traffic and large airports. Impulsive noise generated from munition and ordnance explosions on the PIRA would be fundamentally different from the continuous noise. For example, permanent damage to unprotected ears due to continuous noise occurs at approximately 85 dB based on an 8-hour-per-day exposure, while the threshold for permanent damage to unprotected ears due to impulsive noise is approximately 140 dB peak noise based on 100 exposures per day (Pater 1976).

Thus given the difference between continuous and impulsive noise, the variations in frequency and period of noise exposure, and the fact that the human ear cannot perceive all pitches and frequencies equally well, a number of different measures of noise levels are used in this assessment: the peak sound level (dBP), the SEL, and the DNL.

3.10.2 Peak Sound Levels

Weapon-related impulsive noise is often represented as dB (peak) or dBP, the unweighted peak sound level that is equivalent to the instantaneous peak SPL. Criteria for judging the acceptability of detonation noise in terms of unweighted peak noise levels have been developed in response to complaint data or surveys of residents living near military ranges and quarries. It was reported that no significant public reaction occurs during the day or night for peak levels below 128 dB (U.S. Army 2001). In 1991, the U.S.

Army Environmental Health Agency, now the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) provided guidelines for evaluating peak blast noise levels generated from military tests and training (Table 3-9). The Army conducted studies to correlate annoyance with measured dBP and concluded that the dBP criteria are useful for noise complaint management and investigation and that dBP provides a good estimate of the perceived vibration of typical residential construction results from blasts.

Table 3-9

Guidelines for Evaluating Peak Blast Sound Levels

Sound Levels (dB Peak)	Risk of Noise Complaints
<115	Low
115–130	Moderate
130–140	High, and possibility of damage
>140	High risk of physiological and structural damage claims

Source: Pater 1976.

However, when high-intensity impulsive noise is evaluated to determine its effects on a human population, C-weighted sound levels are used so that the low-frequency effects of the noise are considered. The low-frequency content of impulsive noise contributes to effects such as window rattle that influence people's perception of and reaction to the noise. The CSEL values can be determined by subtracting 25 dB from the values in Table 3-9 (U.S. Army 2001). Therefore a CSEL value of 90 dB would equate to a low risk of complaints for high-intensity noise events.

3.10.2.1 Measurements of Aircraft Noise Impact on Human Annoyance

In 1977, at the request of the U.S. EPA, the National Academy of Science's Committee on Hearing, Bioacoustics and Biomechanics (CHABA) proposed guidelines for the uniform description and assessment of the various noise environments associated with various projects. In 1982, the U.S. EPA published *Guidelines for Noise Impact Analysis*, based on the CHABA Guidelines. According to CHABA Guidelines, the Leq and DNL were selected as the appropriate descriptors for noise because they reliably correlate with health and welfare effects. From data on community social surveys, DNL has been found to correlate with community annoyance, as measured in terms of percentage of exposed persons who are "highly annoyed" (%HA) (Table 3-10).

Correlation between DNL and CDNL has been established based on community reaction to impulsive sounds (CHABA 1981). The DoD has followed the recommendations of CHABA in describing high-intensity impulsive sounds, such as explosions, in terms of C-weighted sound exposure level. Table 3-10

shows the relationship between the percent of the population highly annoyed by sound levels expressed as DNL and CDNL.

Table 3-10
Relationship Between C-Weighted and A-Weighted Sound Levels and Percent of the Population Annoyed

CDNL (C-weighted)	% Highly Annoyed	DNL (A-weighted)
48	2	50
52	4	55
57	8	60
61	14	65
65	23	70
69	35	75

Note: CDNL can be interpreted in terms of "equivalent annoyance" DNL.
Source: CHABA 1981

A DNL of 65 dBA or lower is considered to be acceptable (Table 3-10); a DNL above 65 dBA but not exceeding 75 dBA is normally unacceptable unless some form of noise attenuation is provided; a DNL higher than 75 dBA is unacceptable. Daily exposure to explosions with a CDNL of 61 dB or less is comparable to the DNL 65 dBA significance level for non-impulsive noise.

Explosion noise levels measured as a CSEL also provide a metric for potential impacts to humans over a short-term duration, rather than averaged over a 24-hour period. For example, CSEL values can be used to evaluate potential physiological startle responses and other short-term annoyance factors. Table 3-11 shows the relationship among CSEL, peak SPL, and SEL.

3.10.2.2 Measurements of Noise Impact on Land Use Compatibility

In 1980, the Federal Interagency Committee on Urban Noise (FICUN) published guidelines for considering noise in land use planning (FICUN 1980). Federal agencies have adopted these guidelines as the standard when making recommendations to local communities on land use compatibility issues. Table 3-12 shows the types of land uses that would be appropriate based on a range of DNL values.

Again, a DNL of 65 dBA or lower is considered to be acceptable (Table 3-12); a DNL above 65 dBA but not exceeding 75 dBA is normally unacceptable unless some form of noise attenuation is provided; a DNL higher than 75 dBA is unacceptable. Daily exposure to impulsive noise of CDNL of 61 dB or less

is comparable to the DNL 65 dBA significance level for non-impulsive noise and is normally considered compatible with most land uses.

Table 3-11

Relationship Between SEL, Peak dB, and CSEL

CSEL (dB)	Peak SPL (dB)	SEL (dB)
85.4	113.6	75.9
94.0	121.6	84.5
100.4	127.6	90.9
106.9	133.6	97.4
110.7	137.1	101.2
113.4	139.6	103.9
115.5	141.6	106.0
117.2	143.1	107.7
119.9	145.6	110.4
121.9	147.6	112.4
123.6	149.2	114.1
125.1	150.5	115.6
127.4	152.7	117.9
129.3	154.4	119.8
130.9	155.9	121.4
132.2	157.1	122.7

3.10.3 Existing Noise Setting

3.10.3.1 On-Base Region

Major noise sources at Edwards AFB are aircraft operations that include rotary wing air traffic, engine testing, sonic booms, and vehicle traffic on streets. The major sources of motor vehicle-related noise at Edwards AFB are Lancaster Boulevard, Rosamond Boulevard, and primary and secondary streets on the base.

Noise estimates are usually presented as noise contours. Noise contours are lines on a map of an airfield and its vicinity where the same noise level is predicted to occur. The 5-dB interval chosen to represent noise contours reflects the Department of Housing and Urban Development (HUD) noise criteria commonly used for airfield noise. Figure 3-11 shows the CNEL noise contours at Edwards AFB.

As shown in Figure 3-11, Runway 22 noise contours for a CNEL of 60 dB and above lie completely within the boundary of Edwards AFB. Parts of the on-base recreation areas lie between the 65- and 70-dB contours. These areas include the Edwards AFB Rod and Gun Club (Combat Arms Range), base golf

course, off-highway vehicle area number 1, and some of the picnic areas and athletic fields. The Main Base residential area is outside the 60 dB contour.

The Main Base has a range of exposure from 65 to 85 dB; the South Base has a range of 70 to 85 dB. On-base land under the 80 dB noise contours is primarily open space and test program support area. The South Base and a portion of the Main Base are currently within the 80 dB noise level; therefore, small areas of administrative, commercial, and industrial land are subject to these noise levels.

The area around AFRL is subject to very high levels of noise during rocket engine tests. Test firings occur infrequently during daytime hours for 1 to 3 minutes at a time. Personnel at the test site remain in buildings designed to protect them from high noise levels. Smaller engines are also tested at this location, and noise levels are less than half those produced by the large Titan engines. Approximately 1,750 people reside within the 80-dB contours of Titan test firings.

3.10.3.2 Off-Base Region

The off-base regions under R-2515 consist primarily of open space, but include industrial, residential, commercial, and public/recreation centers as well. The MOA Range NOISEMAP (MR_NMAP) noise model was used to develop the ambient noise contours for the R-2515 restricted area. Collectively, the models in MR_NMAP together are representative of the way aircraft fly in military airspace, and there are three general representations: broadly distributed operations that generally occur in MOAs and ranges, distributed parallel tracks that occur along MTRs, and specific tracks that occur in target areas. The noise models contained in MR_NMAP assume operations in MOAs and restricted airspace areas are uniformly distributed which accounts for noise contours following the borders of the airspace (MR_NMAP Manual 1997). The total noise contours as shown in Figure 3-12 include the effects of distributed aircraft operations and that of low level and other test routes that lie within R-2515.

As shown in Figure 3-12, the day-night sound levels on the A-weighted decibel scale (L_{dn}) noise contours resulting from subsonic aircraft operations in the R-2515 special use airspace show the maximum L_{dn} value of 45 dB along the perimeter of the restricted use airspace. The surface L_{dn} values for most of the interior of the airspace range from 50 to 55 dB. Noise contours for 60 dB and above lie completely within the boundary of Edwards AFB, therefore, ambient noise levels in the off-base regions adjacent to Edwards AFB for Alternatives A, B, and C are anticipated to be below a CNEL of 60 dB under normal conditions (AFFTC 1997). However, there are areas within the off-base region where noise levels exceed 60 dB due to freeways, major highways, airports, and other noise-generating operations.

Table 3-12

Land Use Compatibility

Land Use	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65–70	70–75	75–80	80–85	Over 85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N[1]	N[1]	N[1]	N	N
Public Use						
Schools	Y	N[1]	N[1]	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoria, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y[2]	Y[3]	Y[4]	Y[4]
Parking	Y	Y	Y[2]	Y[3]	Y[4]	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y[2]	Y[3]	Y[4]	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y[2]	Y[3]	Y[4]	N
Photographic and optical	Y	Y	25	30	N	N

Table 3-12 (Continued)

Land Use Compatibility

Land Use	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65–70	70–75	75–80	80–85	Over 85
Agriculture (except livestock) and forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Livestock farming and breeding	Y	Y[6]	Y[7]	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y[5]	Y[5]	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Table 3-12, Page 2 of 3

Notes: Numbers refer to notes below.

* - The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

Y (YES) - Land Use and related structures compatible without restrictions.

N (No) - Land Use and related structures are not compatible and should be prohibited.

NLR - Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35 - Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structures.

Table 3-12 (Continued)

Land Use Compatibility

Notes: (Continued)

1 - Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.

2 - Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

3 - Measures to achieve NLR 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

4 - Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

5 - Land-use compatible provided special sound reinforcement systems are installed.

6 - Residential buildings require an NLR of 25.

7 - Residential buildings require an NLR of 30.

8 - Residential buildings not permitted.

Source: 14 CFR Part 150

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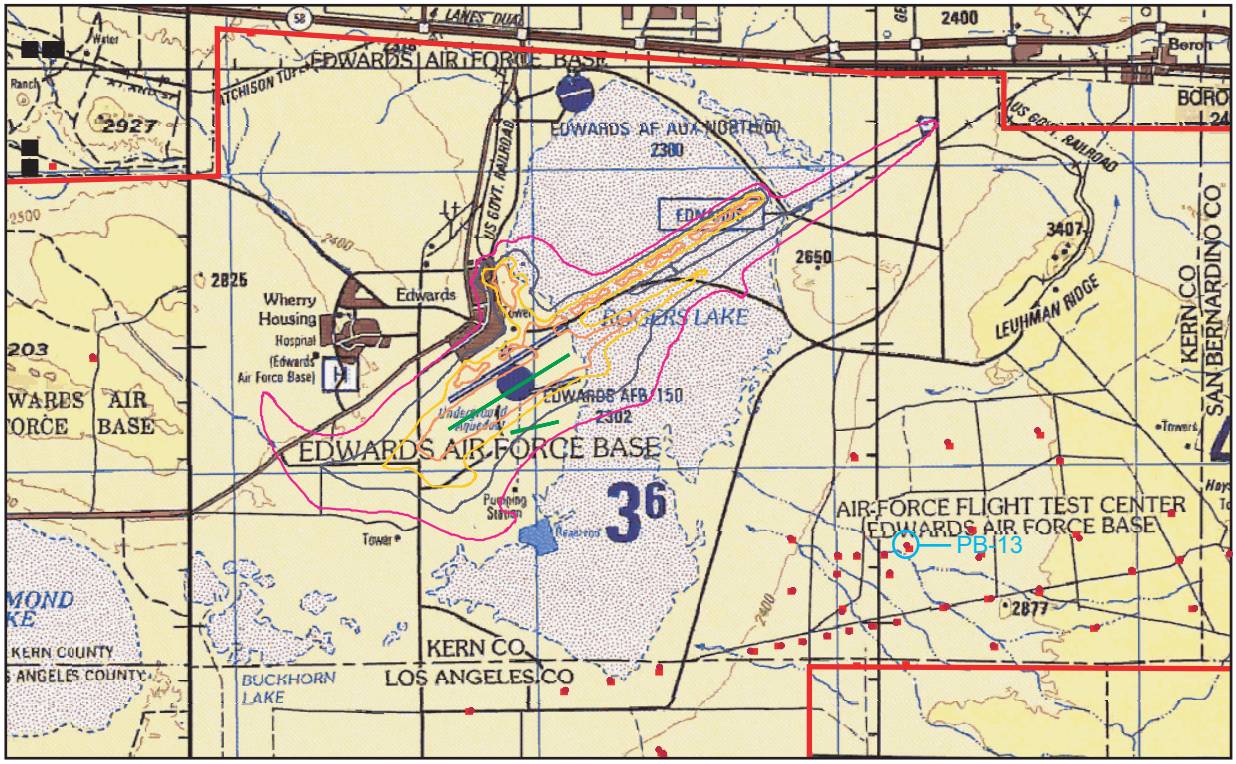
Figure 3-11 Noise Contours around Runway 22 at Edwards AFB



LEGEND

NOISEMAP CONTOURS

- 65 dB CNEL
- 70 dB CNEL
- 75 dB CNEL
- 80 dB CNEL
- Edwards AFB Runways
- Target Locations
- Edwards AFB Boundary

0 1 2 3 4 5 Miles

Environmental Assessment for
Armed Munitions Integration Testing
on the Precision Impact Range Area

NOISE CONTOURS AROUND
RUNWAY 22
AT EDWARDS AFB

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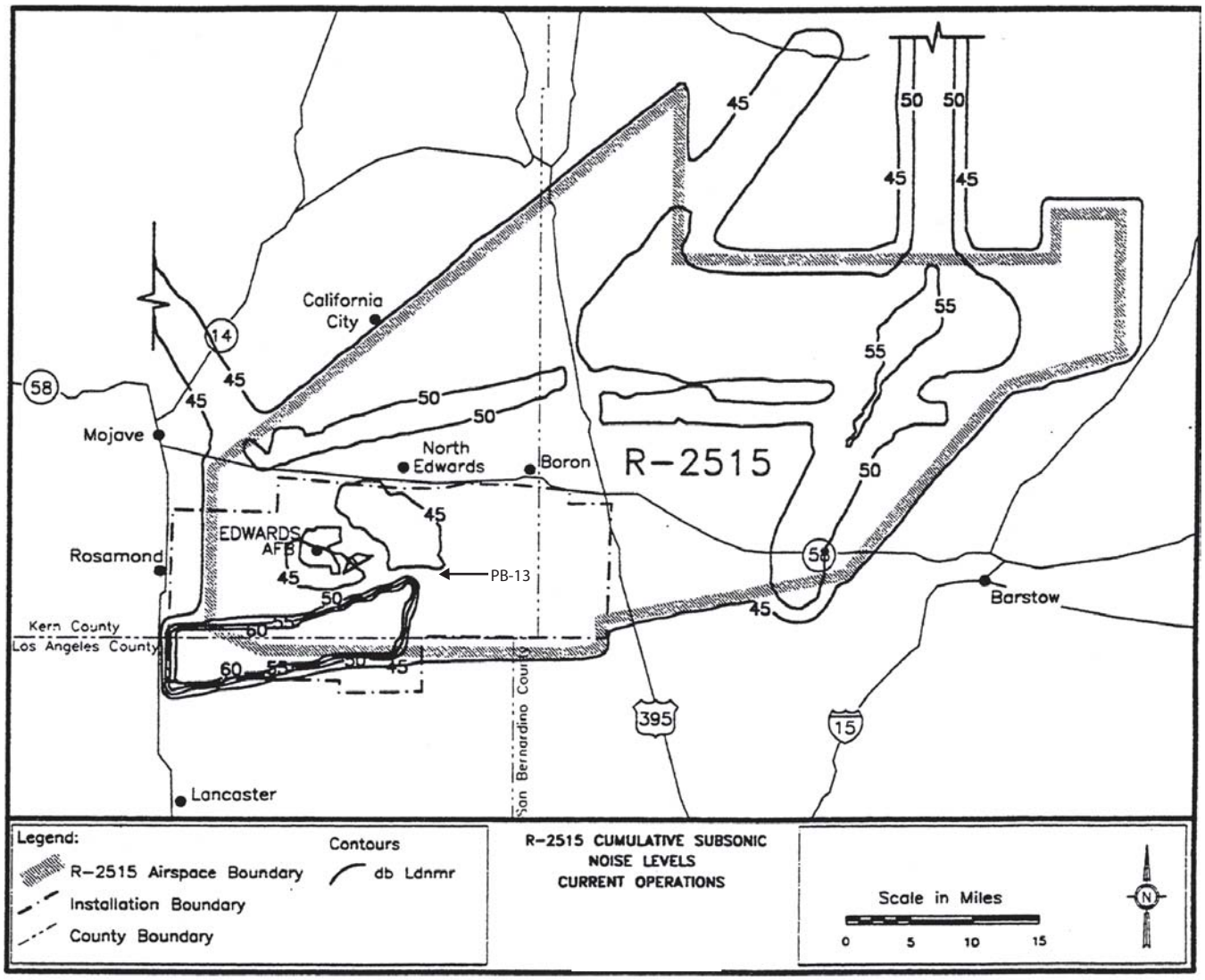

Source: AFFTC 1995b and Spectrum Sciences

Figure 3-12 Cumulative Subsonic Noise Levels for R-2515

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3.10.3.3 Precision Impact Range Area, PB-13 Target

Aircraft Noise

For on-base regions Figure 3-13 shows the noise contours resulting from aircraft operations using the conventional bombing pattern flown to target PB-10, which lies approximately 1.5 miles west of PB-13.

Armed Munitions Noise

The PIRA PB-13 target area is open space that is restricted from public/recreational use. As shown in Figure 3-14 the A-weighted dB scale (L_{dn}) noise contours resulting from simulated 445-pound NEW detonation (MK 83 General Purpose [GP] bomb) show a maximum "day focus" L_{dn} value of 60 dBA at 1,060 feet from ground zero and 1.7 nautical miles (NM) from the base boundary. The L_{dn} value at the base boundary is 24 dBA. These values were calculated using the BNOISE2 program developed by the Army's Construction Engineering Research Lab (CERL). The BNOISE2 program characterizes the noise impacts resulting from detonations of various munitions. The day focus propagation produces a cluster of converging sound rays and thus a higher sound level at a given distance. The cluster condition producing the highest sound level at a given distance is called "focus."

The unweighted peak values (dBP) for the MK 83 are shown in Table 3-13 as compared to the MK 82 and MK 84 GP bombs.

Table 3-13

Sound Levels for Various General Purpose Bombs

Type of General Purpose Bomb	MK 82	MK 83	MK 84
Total Bomb Weight (pounds)	500	1,000	2,000
Net Explosive Weight (pounds)	192	445	970
Range from Target (feet)	Sound Level (dB Peak)		
6,561.5	148.5	150	153
13,123.2	138.0	141	143
26,246.4	130.5	133	135.5
52,492.8	123.0	125.5	128
78,739.2	118.5	121	123
118,108.8	113.5	116	118.5

Source: Russell 2004.

3.10.4 Vibrations

The impulsive sound pressure from the detonation of explosive charges can cause structures to vibrate. This vibration is generally perceived by the occupants as the rattling of windows and objects on shelves. House shaking is commonly blamed on ground-borne vibrations. Studies of coal mine detonations (Fort

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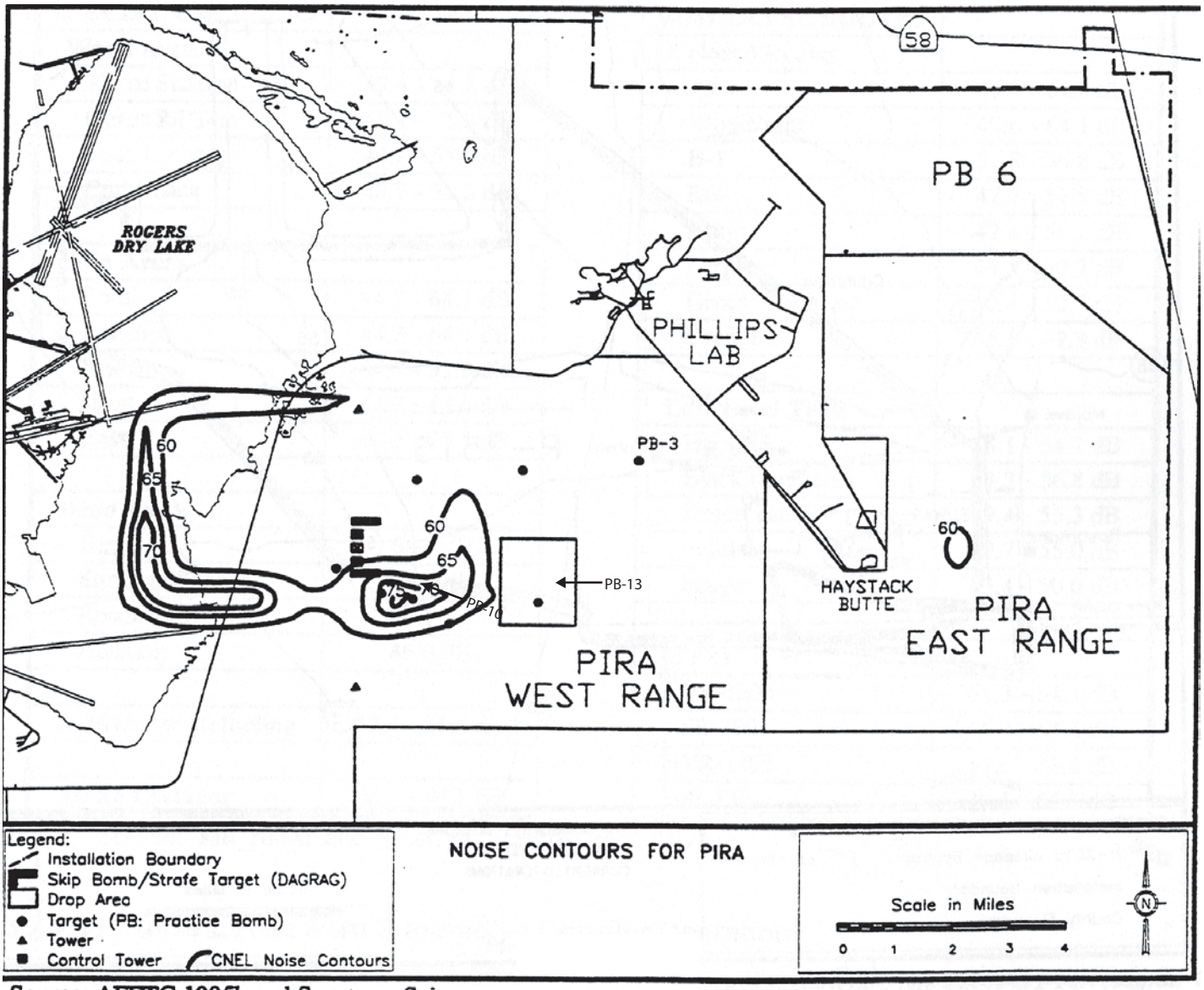

Source: AFFTC 1995b and Spectrum Sciences

Figure 3-13 Noise Contours on the PIRA

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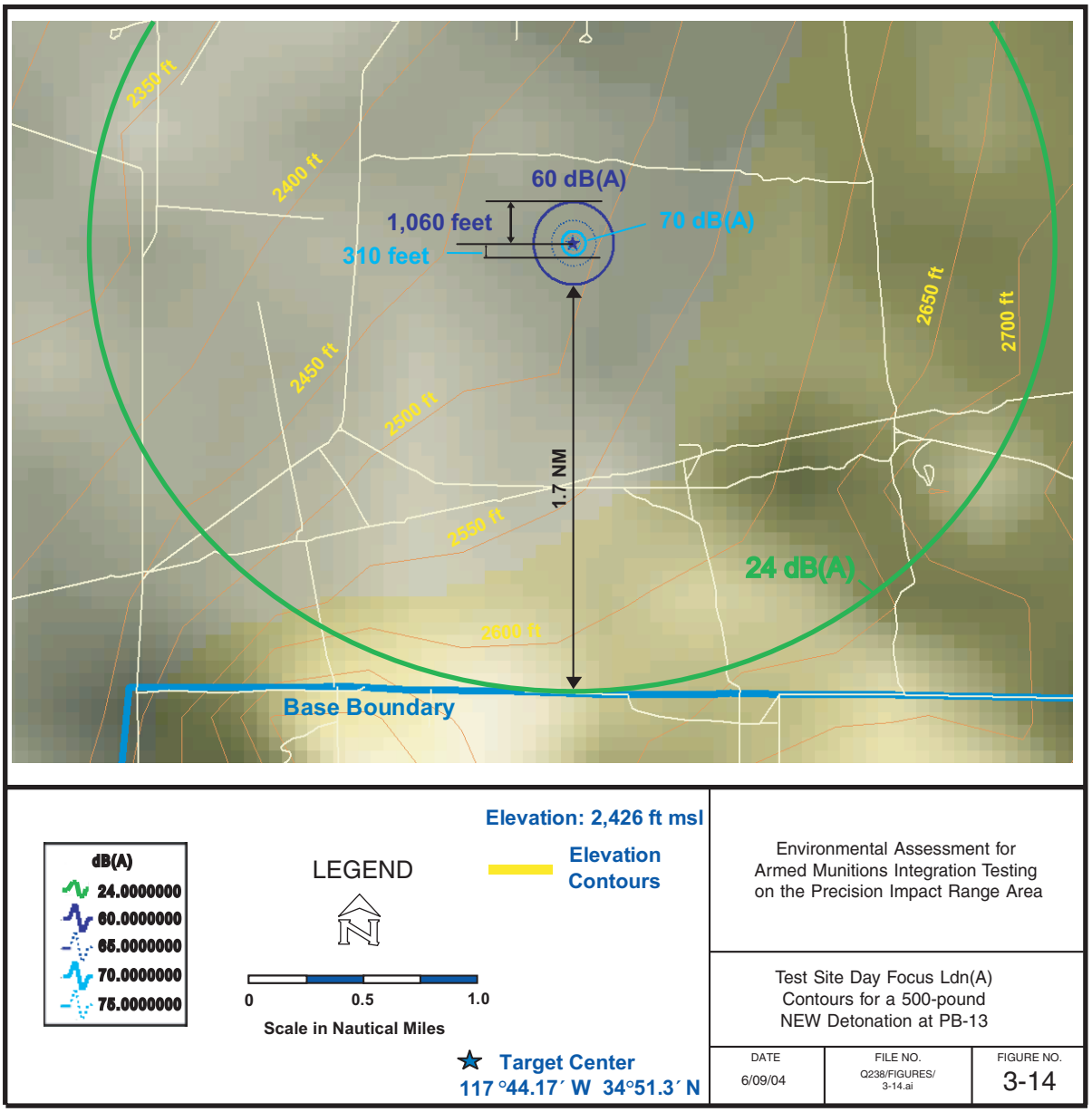
2350 ft
2400 ft
60 dB(A)
1,060 feet
310 feet
70 dB(A)
2650 ft
2700 ft
2450 ft
2500 ft
1.7 NM
2550 ft
24 dB(A)
2600 ft
Base Boundary
dB(A)
24.0000000
60.0000000
65.0000000
70.0000000
75.0000000
LEGEND
Elevation: 2,426 ft msl
Elevation Contours
0
0.5
1.0
Scale in Nautical Miles
Target Center
117 °44.17´ W 34°51.3´ N
Environmental Assessment for Armed Munitions Integration Testing on the Precision Impact Range Area
Test Site Day Focus Ldn(A) Contours for a 500-pound NEW Detonation at PB-13
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McCoy 2003) indicate that the ground-borne vibration dominates house vibration at scaled distances of less than 50 feet. At scaled distances greater than 50 feet, airborne vibrations dominate. For a 100-pound charge, the ground-borne vibration is the dominant cause of house vibration if the house is less than 500 feet from the detonation point. At distances greater than 500 feet, the airborne sound wave is the dominant cause of vibration (U.S. Army 2003). Humans can typically perceive ground-borne vibrations as low as 0.08 to 0.20 inches per second (U.S. Army 2003). A summary of typical vibration levels is listed in Table 3-14.

Table 3-14

Typical Vibration Levels

Type of Response		Ground Vibration (inches/second)
Human:		
	Perceptible	0.08
	Noticeable	0.2
	Unpleasant	0.38
	Disturbing	0.8
	Objectionable	1.3
Structure:		
	Minor damage (fine cracks in plaster)	5.4
	Major damage	7.6

Source: U.S. Army 2003

The maximum threshold for ground-borne vibration level recommended by the U.S. Bureau of Mines to prevent threshold damage is 0.5 inch per second. The threshold level at which minor structural damage may begin to occur in 0.01 percent of structures is set at 2.0 inches per second.

The maximum predicted ground vibration at 1.25 mile, 2.5 miles, and 5 miles for the detonation of a 500-pound NEW charge is 0.00926, 0.00333, and 0.00119 inch per second.

3.10.4.1 Vibration from Airborne Sound

Airborne sound is the dominant cause of vibration on structures on and off Edwards AFB and within the PIRA. Most of the studies of airborne vibration and damage guidelines are derived from studies using sonic booms as the airborne sound source. The vibration from the detonation of bombs, rockets, and mortars is similar to the vibration from the sonic booms. Structural shaking or window rattling by airborne sound can annoy the occupants and cause possible structural damage. The vibration levels and corresponding unweighted peak sound pressure levels for annoyance and damage (Fort McCoy 2003) are

listed in Table 3-15. The probability of windows breaking as a result of airborne sound levels as summarized in Table 3-16.

Table 3-15

Airborne Vibration Levels

Response	Vibration Level (inches/second)	Sound Level (dB peak)
Concern by homeowner about structural rattling and possible damage	0.1	120
Glass and plaster cracks under worse case conditions	0.5	134
Structural damage to lightweight superstructures	>2.0	175

Table 3-16

Probability of Window Breakage

Pressure (pounds/foot^2)	Sound Level (dB Peak)	Probability of Breakage (per million pane events[a])
1	128	0.28
10	148	5,000
100	168	380,000

Note: a – Number of windowpanes broken for each million panes exposed to a blast event.

Source: U.S. Army 2003

3.11 PUBLIC/EMERGENCY SERVICES

Public/emergency services refer to the capability of ensuring protection of people and property. Public/emergency services at Edwards AFB ensure the protection of base personnel and property. The public/emergency service umbrella at Edwards AFB consists of the Fire Department, Security Forces, and the Medical Group.

3.11.1 Fire Protection/Prevention

Fire protection on base comprises personnel and equipment that are organized and trained to respond to emergencies. The emergency response time of the Fire Protection Division is contingent upon the distance to the emergency site and the availability of personnel, support equipment, and supplies. All areas of the base are currently covered.

The weapons delivery aircraft for Alternatives A, B, and C would utilize Runway 22 for takeoff and landing. This area is located near and serviced by Fire Station No. 1. The fire station is a 26,200-square-foot facility providing fire protection and emergency medical service as needed for the entire base. Vehicles assigned to this fire station include two engines, five Aircraft Rescue Fire Fighting vehicles, one

rescue vehicle, a 5,000- and a 2,000-gallon water tender, and two airfield surveillance vehicles. A maximum of 35 firefighters are housed in this facility.

3.11.2 Security

Security forces provide general law enforcement on Edwards AFB. Law enforcement duties include traffic stops, domestic disputes, and police investigations. Security forces (police) on base comprise personnel and equipment organized and trained to respond to a series of emergencies, as well as to provide a daily security presence. Security programs provide the means to counter threats during peacetime, mobilization, or wartime.

3.11.3 Medical Services

Medical services on-base comprise personnel and equipment that are organized and trained to respond to a series of emergencies. Air Force Instruction 41-106, *Medical Readiness Planning and Training*, establishes procedures for medical readiness, planning, and training during peacetime and wartime operations.

3.12 SAFETY

Safety is defined as the protection of workers and the public from hazards. The total accident spectrum encompasses not only injury to personnel, but also damage or destruction of property or products. For worker safety, the boundary of the immediate work area defines the ROI. For public safety, a much larger area must be considered. This area varies depending upon the nature of the operation, but may extend for miles beyond the source of the hazard.

Potential health and safety issues on Edwards AFB include radiological, biological, chemical, and physical hazards, as well as weapons, flight, ground, range, and test [systems] safety.

The AFFTC's institutional safety program is intended to minimize accidental injury, illness, and loss of property. AFFTC's Safety Office is responsible for monitoring the safety programs through a system of inspections, surveys, audits, and follow-up investigations. Elements of the safety program include accident and injury prevention and reporting, fire prevention and protection, emergency preparedness, and hazardous material and waste management. An Emergency Response Plan is in place to address emergencies such as earthquakes, aircraft accidents, fires and explosions, bomb threats, civil disturbances, nuclear emergencies, and toxic vapor releases or chemical spills. A base-wide safety reporting system encourages employees to report their concerns about workplace safety.

The AFFTC's occupational health program is intended to recognize, evaluate, and control workplace factors or stresses that may cause sickness, impaired health, or significant discomfort to employees. To protect AFFTC personnel from noise hazards, hearing protection is used if personnel are exposed to noise levels exceeding 85 dBA. The program identifies and quantifies worker exposure to hazardous chemicals, noise, and radiation. Through AFFTC's Hazardous Communication Program, employees are educated regarding proper chemical management principles and procedures.

3.12.1 Range Safety

The national range system, established by P.L. 81-60, was originally sited based on two primary concerns: location and public safety. Thus, range safety, in the context of national range activities, is rooted in P.L. 81-60 and Department of Defense Directive 3200.11*, Use Management*, and *Operation of Department of Defense Major Range and Test Facilities*; both provide the framework under which the national ranges operate and provide services to range users. To provide for the public safety, the ranges, using a Range Safety Program, ensure that the weapons delivery testing presents no greater risk to the general public than that imposed by overflight of conventional aircraft.

It is the policy of the Edwards AFB Range to ensure that the risk to the public, military personnel, government civilian workforce, contractors, and to national resources is minimized to the greatest degree possible. This policy is implemented by using risk management in the areas of public safety; launch area safety, and landing area safety. Range users are required by Edwards AFB to demonstrate, through risk modeling, that the lowest possible risk is achieved, consistent with AFFTC mission requirements and risk guidance. The AFFTC Chief of Safety has responsibility for approving the proposed flight plans and flight safety criteria. The AFFTC Commander has final authority and responsibility for the safety of the proposed action. The Range Commander may deviate from these mission criteria based on geography, weather, and national need; however, the basic standard is no more risk than that voluntarily accepted by the general public in normal day-to-day activities (NASA 1997).

Health and safety issues related to aircraft operations (both routine and emergency management) involving ground personnel working near operating aircraft during taxiing and inspection activities, aircrews using runways (lakebed and non-lakebed surfaces), and personnel present during emergency operations, aircraft malfunction, or other mishap are specifically addressed in Air Force Flight Test Center Instruction (AFFTCI) 11-1*, Air Operations,* and AFFTCI 11-2*, Ground Operations*. These instructions address in-flight operations, flight preparation, and ground procedures directly related to the

safety of personnel on the ground, as well as emergency procedures for the protection of all personnel at Edwards AFB.

A fundamental requirement of the Edwards AFB Flight Safety Program is that each unit conducting or supporting flight operations has a flight safety program as well as a Midair Collision Avoidance Program.

3.12.2 Exposure Hazards

Non-ionizing Electromagnetic Radiation

Non-ionizing electromagnetic radiation (EMR) comes from two major sources on base: radio frequency emitters (i.e., radar, radar-jamming transmitters, and radio communication equipment), which are regulated in accordance with the Air Force Occupational Safety and Health (AFOSH) Standard 48-9, *Radio Frequency Radiation Safety Program* and laser emitters (lasers), which are regulated by AFOSH Standard 48-10*, Laser Radiation Protection Program*. Sources of EMR at Edwards AFB exist throughout flightline areas, and include fixed location radar, airfield management equipment, and aircraft equipment/instrumentation. Electromagnetic radiation can cause thermal and photochemical injuries to humans, particularly to the eyes and skin. Standards and practices are in place to shield and isolate workers from operational hazards surrounding existing EMR sources.

The Bioenvironmental Engineering Office periodically visits and evaluates the operations of all known AFFTC industrial radiation users as a part of the Industrial Hygiene Surveillance Program. This office also annually verifies the list of on-base radio frequency radiation emitters. Any proposed use of emitters is evaluated using a preliminary radiation hazard analysis. Using a permissible exposure limit (PEL), a proper hazard analysis is accomplished. This PEL is expressed in terms of safe distance limits from the emitting source. Compliance with these limits is required as a Standard Operating Procedure (AFFTC 1997d).

Lasers

There are many laser-based systems used in Edwards AFB operations, most of which are used on aircraft during flight operations as target-range finders and target designators. Laser weapons are used for test and training activities at approved locations on Edwards AFB under scheduled and controlled conditions (i.e., Integrated Facility for Avionics Testing, Benefield Anechoic Facility).

Lasers produce narrow beams of light that may or may not be in the range of light visible to humans. Edwards AFB tests about four types of American National Standards Institute Class 3 lasers, which are mainly used for range operations (Cogan 1995).

Explosives and Propellants

Explosives and propellants are used and stored in a number of locations throughout Edwards AFB. An inhabited building separation distance (or clear zone) has been established around each of the existing explosives and/or propellant use/storage locations. The size of the clear zone varies based on the quantity and type of explosive used, or propellant stored. Clear zones ensure the safety of all personnel in the area from the potential overpressure hazard associated with use and storage of these materials.

3.13 SOCIOECONOMICS

Socioeconomic resources are the economic, demographic, and social assets of a community. Key elements include fiscal growth, population, labor force and employment, housing stock and demand, and school enrollment.

Edwards AFB makes a substantial contribution to the economic status of the surrounding communities within the Antelope Valley.

The Antelope Valley has a labor force of approximately 161,031 persons with an unemployment rate of 13.6 percent. The labor force is employed in a variety of industries including services, manufacturing, construction/mining, retail, government, and agriculture. The military labor force comprised two percent and the government labor force comprised six percent of those employed in the Antelope Valley in 1997 (Alfred Gobar Associates 1997). As of March 31, 1999, Edwards AFB employed approximately 10,920 military, civilians, and contractor personnel.

Edwards AFB provides permanent party housing for military members in the form of dormitories, military family housing, and mobile home park spaces. Edwards AFB has an approximate total of 1,741 housing units with an occupancy rate goal of 98 percent. The number of housing units fluctuates due to the demolition of older units and construction of new units. The number of units ranges from 1,640 to 1,777. Edwards AFB also maintains a 188-space mobile home park for privately owned mobile homes. Personnel with families and unaccompanied members are allowed to reside in the park (MARCOA Publishing, Inc. 1998).

Unaccompanied enlisted members and designated key and essential personnel are required to live on base. Edwards AFB has two- and three-story dormitories, each housing from 32 to 84 members in single and double rooms. A new complex with single rooms has recently been opened. Transient quarters are available through the Billeting Office.

Edwards AFB has three elementary schools and one junior/senior high school, both under the jurisdiction of the Muroc Unified School District. The 1998 to 1999 school year enrollment for these schools was 385, 346, and 457, respectively. The 1998 to 1999 school year enrollment for Desert Junior/Senior High School was 626.

Several additional school districts exist within the Antelope Valley. For the 1998 to 1999 school year, total enrollment in these school districts was 128,029 (California Department of Education). Numerous private schools also exist within this region.

In fiscal year 1998, Edwards AFB expended $3,186,230 for training and education of active duty personnel and civilians. Impact Aid provided by the Department of Education to school districts that are associated with Edwards AFB was $4,631,541 for fiscal year 1998. This aid is provided to schools that have children who reside on base or whose parents work on base, or both. These parents may be active duty military or civilians (Levell 1999).

3.14 WATER RESOURCES

This section describes the surface water and groundwater resources for Edwards AFB including their source, quantity, and quality.

3.14.1 Water Quantity and Source

Jurisdictional waters of the United States do not occur within Edwards AFB (USACE 1996). Non-jurisdictional water resources at Edwards AFB include groundwater, water from the AVEK Water Agency, storm water drainage/flood prone areas, treated wastewater effluent, artificial ponds supporting aquatic habitat and recreation, dry lakes, and ephemeral streams. The AFFTC purchases potable water from the AVEK Water Agency through a water distribution system located in Boron, California. Treated wastewater effluent is used for some urban landscape irrigation and feeds some artificial ponds (AFFTC 2002).

The PIRA is located within three water basins; the western two-thirds of the PIRA is within the Antelope Valley Basin. The Antelope Valley is a single, undrained, closed basin. The principal source of recharge

to the aquifer system in the Lancaster subbasin is infiltration of rainfall runoff through alluvial fans of creeks flowing off the San Gabriel Mountains on the southern boundary of the Antelope Valley (AFFTC 2002). Recharge from infiltration in the hills on the eastern and northwestern parts of the Edwards AFB area is minimal because precipitation is low and evaporation is high. Major faults that cut through the alluvial deposits in the Antelope Valley act as partial barriers to the movement of groundwater. Water-level differences of more than 300 feet in the same aquifer may be present. Storm water may enter the groundwater directly through giant desiccation cracks and fissures, but this is considered to be a small source of recharge because of the low permeability of the lakebed surface (AFFTC 2002).

Groundwater has been an important source of water for the Antelope Valley since development began there in the late 1800s, and for the base since 1947. In recent years of rapid urban growth and drought, between 50 and 90 percent of all water demands in the Valley were satisfied by groundwater. Groundwater pumping and irrigation of crops began to decrease when water levels declined. Groundwater depth has declined approximately 90 feet since 1947 (AFFTC 1999). Edwards AFB uses 15 groundwater wells, 10 of which are reserved for drinking water purposes (AFFTC 2002). South Track, near the southern boundary of Rogers Dry Lake, has eight of the wells in production and taps the deep aquifer to provide potable water to the main Base. The 10 potable water wells have a maximum combined production capability of 15.6 million gallons per day (AFFTC 2002).

Static groundwater in the vicinity of PB-13 is estimated to be at 191 to 210 feet below ground level as measured by monitoring wells 442/1-MW01 and 442/2-MW01 in March 2003, and monitoring well 270-MW01 as measured in May 2002.

3.14.2 Water Quality

The U.S. EPA's Office of Water establishes the groundwater and drinking water quality standards found in the National Primary Drinking Water Regulations (or primary standards) that are legally enforceable and apply to public water systems. Edwards AFB must also conform to standards for clean water set by the California Department of Health Services. The Lahontan Regional Water Quality Control Board and California Department of Health Services, Southern California Field Operations Branch, Tehachapi District, administer these standards locally. Primary standards protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and are known or anticipated to occur in public water systems. The Bioenvironmental Engineering Office monitors base groundwater quality and compliance with drinking water standards.

Because of the history of the PIRA and its size, past practices may have contributed to soil and/or groundwater contamination. In the past, ranches, homesteads, and mining operations were prevalent in the Antelope Valley including the area that is now within PIRA boundaries. Past activities on the PIRA may have included improper storage, disposal, and/or burial of solid or hazardous materials. Section 3.6 describes the environment with respect to identified hazardous materials that have the potential to contribute to soil or groundwater contamination.

3.14.3 Storm Water Drainage/Flood-Prone Areas

Edwards AFB is situated at the bottom of Antelope Valley Watershed Basin, roughly a 2,400 square mile watershed with no outlet. Rainfall in the San Gabriel Mountains southwest of Edwards AFB, and in the Techapi Mountains northwest of the Base, drains in relatively well-defined streams toward the valley. The streams flow to the valley floor and transition to an overland sheet flow pattern. Sediment deposition has resulted in the following landforms:

- Transitional alluvial fans nearest the mountains with loamy, sandy, and gravelly sediments of high permeability;
- Desert plateaus toward the middle of the valley with sandy and silty sediments of intermediate permeability; and
- Playa lakebeds at the central low points of the valley with silty and clayey sediments of low permeability.

There are no perennial streams on Edwards AFB. Storm water runoff for the entire watershed is directed toward three large playa lakebeds: Rogers, Rosamond, and Buckhorn Dry Lakes. Playas are expansive, ancient dry lakes that fill with water during the rainy season. Water may be retained in these playas for several months due to mostly impermeable, alkaline, saline soils that contain high levels of solute, sodium, and total dissolved solids. Any water reaching these lakebeds is trapped and subsequently evaporates (AFFTC 2002; U.S. Geological Survey [USGS] 1998).

In general, drainage tends to flow toward the nearest dry lakebed. Rosamond and Buckhorn Dry Lakes, in turn, drain toward Rogers Dry Lake (AFFTC 1993). Water level elevations (above MSL) for Rosamond Dry Lake during flood conditions are described in Table 3-17 (AFFTC 1993).

Table 3-17

Water Level for Rosamond Dry Lake Flooding Events

Flood Level	Lake Elevation (feet above MSL)
50-year	2,280.9
100-year	2,282.2
200-year	2,283.4

Despite the apparent potential for the formation of a sizable lake, the playa lakebeds remain dry most of the time due to arid climate conditions. The average annual rainfall at the base is approximately 5 inches; the maximum recorded 1-year rainfall was 15.5 inches, which occurred in 1983. The average annual evaporation, as measured by a nearby Mojave pan evaporation gauge from 1939 to 1959, is 11.4 inches.

The Mojave Creek Floodplain is a well-defined drainage that runs southeast along the north and east of the residential area of Main Base along Lancaster Boulevard, and crosses Rosamond Boulevard where it runs southward just west of South Base and empties into Rogers Dry Lake. Mojave Creek is dry for most of the year, but periodic flooding does occur during above-normal rainfall (AFFTC 1993). As discussed in the base *Stormwater Pollution Prevention Plan* (September 1998), the storm water collection system consists of drainage ditches (flowing east to Rogers Dry Lake) and storm water retention ponds (located on the west edge of Rogers Dry Lake) (AFFTC 2002).

In 1993, a flood study of the base was conducted to determine floodplain constraints (AFFTC 1993). Rogers Dry Lake, Rosamond Dry Lake, and Mojave Creek (which empties into Rogers Dry Lake) were identified as the most critical flood-prone areas. A small portion of Rogers Dry Lakebed extends into the PIRA along the Mercury Boulevard/West Range boundary in the North Flank areas. Other flood-prone areas on-base occur in the residential area where no channels are present to divert heavy storm water runoff.

The AFFTC 1993 flood study estimated a flood-of-record inundation elevation to be used for planning purposes and performed a risk of flooding analysis of existing base facilities near Rogers Dry Lake. This level represents the maximum water surface elevation that would occur during a flood of reasonably high return interval (e.g., 50 years, 100 years). The level of flooding that occurred in 1943 was estimated to be the flood-of-record-level. Most development on Edwards AFB is above this estimated flood-of-record-level of 2,277.4 feet (North American Vertical Datum [NAVD] of 1988). Only a small portion of the NASA ramp and North Base are affected. Relatively high flooding in 1993 remained more than 3 feet below the estimated flood-of-record level (AFFTC 1993).

Target PB-13 is not located in a flood-prone area (AFFTC 2002). There are 20 surface drainage basins delineated on Edwards AFB and target PB-13 is located within the El Mirage-Leuhman Ridge surface water drainage basin.

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4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discusses the potential environmental consequences or impacts associated with Alternatives A, B, C, and D. Changes to the natural and human environment that could result from Alternatives A, B, and C were evaluated relative to the existing environmental conditions described within Chapter 3.0. The first paragraph or discussion under each of the environmental disciplines presents a description of what would constitute a significant impact for that discipline.

This EA only addresses the impacts associated with armed munitions delivery on the PIRA target PB-13. While this analysis looks at the effects of up to 500 pounds of NEW armed munitions, in all probability many of the munitions tested would contain less NEW and the number of missions would be less than requested; therefore this analysis looks at a worst case scenario for the Proposed Action and Alternatives. Analysis of other phases (e.g., weapons development, transportation) will be the responsibility of the intended weapons delivery test program office; separate environmental documentation would be required under these phases of the program.

In general, potential impacts associated with the proposed project fall under one of two categories: (1) impacts associated with normal delivery of the weapons on the target, or (2) impacts associated with off-target impacts.

4.1 AIR QUALITY

Air quality impacts include both policy and physical air quality changes. Air quality impacts are typically judged to be significant if the action being evaluated causes or contributes to a violation of federal or state ambient air quality standards; increases exposure of people to air pollution in concentrations in violation of ambient air quality standards; causes pollutant or pollutant precursor emissions in excess of local air quality management agency impact significance thresholds; or violates federal, state, or local emission limitations for specific pollutants or emission sources.

Kern County is in attainment or unclassified for most air quality standards with the exception of the federal 8-hour and state 1-hour ozone standards and the federal and state PM_{10} standard in one portion of the county, outside the on-base region. The proposed project would have a significant impact on regional air quality if the estimate of total long-term and short-term, direct and indirect project emissions exceeds current air quality standards and/or KCAPCD conformity thresholds within the MDAB.

This evaluation analyzes the maximum emission impacts based on 100 missions per year.

4.1.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

4.1.1.1 On-Base Region

Sources of emissions generated under Alternative A include (1) privately owned vehicles of current on- or off-base Air Force or contractor personnel required for temporary duty for weapons support, (2) one landing and takeoff (LTO) for two aircraft (one delivery aircraft and one chase aircraft) during the weapons delivery event, (3) aerospace ground equipment (AGE), and (4) ground support equipment (GSE) used for unloading weapons to the delivery aircraft (consisting of one light-duty gasoline vehicle [LDGV], one light-duty gasoline truck [LDGT], one heavy-duty gasoline truck [HDGT], one light-duty diesel truck [LDDT], and one backhoe/loader). Emissions from B-52G/H, F-15, F-16, and T-38 aircraft were used in the conformity calculations. The B-52G/H, F-15, and F-16 aircraft would be used to deliver the armed munition to the PB-13 target and the F-16 and T-38 would be used as a chase aircraft (primarily for data collection). Projected aircraft utilization for the armed munition delivery events is shown in Table 4-1.

Table 4-1

Project Aircraft Utilization for Armed Munitions Delivery Events

Type of Event Support	Percent Utilized
Delivery Aircraft	
B-52G/H	10
F-15	68
F-16	22
Chase Aircraft	
F-16	70
T-38	30

Source: Hagenauer 2004

Since there would be no new construction or specialty equipment required, the actual emissions resulting from and assessed under Alternative A primarily would occur from privately owned vehicles, armed munitions delivery, delivery and chase aircraft, AGE, and GSE.

Weapons delivery aircraft flights are anticipated to be 1 hour in duration with approximately 25 percent of that time spent below 3,000 feet AGL. Emissions from weapons delivery aircraft LTOs and flights were

calculated using engine emission factors specific to each potential engine-operating mode as obtained from the Air Force Engineering and Services Center, *Aircraft Engine Emissions Estimator* (Air Force Engineering and Services Center 1985). Engine emission factors were multiplied by:

- The total number of operations expected to occur per weapons delivery event;
- The number of engines operating during a particular operation;
- The time duration in each engine mode for the particular operation; and
- The estimated amount of time the flights are expected to be below 3,000 feet AGL.

The AGE/GSE emissions were calculated using emission factors obtained from *AP-42: Compilation of Emission Air Pollutant Factors* (U.S. EPA 2000), equipment manufacturers, the South Coast Air Quality Management District's *CEQA Air Quality Handbook* (1993), and the CARB's EMFAC7G modeling software. AGE emissions were calculated based on the number of missions per year at 2 hours per mission. GSE emission calculations were performed utilizing duration of activity or miles driven and vehicle engine emissions for the given size ground transport vehicles.

The vehicle emissions from current on- or off-base Air Force or contractor personnel required for temporary duty for 5 days per armed munition delivery event are not evaluated in this analysis because they are exempt under 40 CFR 51.853(c)(2)(vii) and (x). Only vehicle emissions generated as a direct result of project activities were considered. The routine, recurring transportation of personnel and the future activities conducted would be similar in scope to those currently being conducted at existing facilities. This would result in no emissions increase or emissions that are clearly *de minimis*. Therefore, those actions (transportation of personnel in this case) are exempt.

The total project emissions for aircraft, AGE, and GSE for Alternatives A, B, and C for typical weapons delivery events are summarized in Table 4-2. Details of the emission calculations from each activity are provided in Appendix A.

An air conformity applicability analysis was conducted for the proposed project. Although the Kern County portion of Edwards AFB is now in attainment of the federal 1-hour ozone standard, the area remains in non-attainment for both the state 1-hour standard and the federal 8-hour standard. Therefore, the proposed project would conform to the most recent EPA-approved SIP if the total direct and indirect emissions remained below *de minimis* thresholds established in the U.S. EPA's conformity rule for general federal actions. Because the area is considered to be in "serious" nonattainment of the federal 8-

hour ozone standard, the *de minimis* emission thresholds are 50 tons per year of NO_2 and VOCs. In addition, because Kern County is also in "serious" nonattainment of the NAAQS and the CAAQS for PM_{10}, the *de minimis* emissions threshold for PM_{10} is 70 tons per year. Because the area is in attainment for the remaining criteria pollutants, no screening analysis was necessary.

Emissions subject to conformity applicability analysis from aircraft LTOs and flights and AGE/GSE sources are summarized in Table 4-2. Emissions from aircraft operating in airspace above 3,000 feet AGL were not included because these emissions would (1) be released above the mixing height and effectively blocked from dispersion to the surface, or (2) be released from such a height and over such a vast area that ground-level concentrations resulting from downward dispersion would be negligible.

Table 4-2

Conformity Applicability for Total Emissions Sources Associated with Weapons Delivery Testing Program at Edwards AFB, California (tons/year)

Emissions Source	NO_2	VOC	PM_{10}	SO_2	CO
Aircraft LTOs/flights[a]					
Mission Aircraft (B-52G/H, F-15, F-16)					
Alternative A (100 flights)	0.792	2.469	0.060	0.123	4.042
Alternative B (50 flights)	0.396	1.234	0.030	0.061	2.021
Alternative C (10 flights)	0.078	0.247	0.006	0.012	0.402
Chase Aircraft (F-16, T-38)[a]					
Alternative A (100 flights)	0.351	0.284	0.009	0.052	1.898
Alternative B (50 flights)	0.176	0.142	0.004	0.026	0.949
Alternative C (10 flights)	0.035	0.028	0.001	0.005	0.190
Aerospace Ground Equipment					
Alternative A (100 flights)	0.247	0.006	0.022	0.018	0.017
Alternative B (50 flights)	0.124	0.003	0.011	0.009	0.009
Alternative C (10 flights)	0.025	0.001	0.002	0.002	0.002
Ground Support Equipment					
Alternative A (100 flights)	0.345	0.286	3.809	0.018	2.021
Alternative B (50 flights)	0.172	0.143	1.905	0.009	1.010
Alternative C (10 flights)	0.034	0.029	0.381	0.002	0.202
Detonations[b]					
Alternative A (100 flights)	15.181	0.043	17.685	N/A	10.787
Alternative B (50 flights)	7.590	0.022	8.843	N/A	5.394
Alternative C (10 flights)	1.518	0.004	1.768	N/A	1.079

Table 4-2, Page 1 of 2

Table 4-2 (Continued)
Conformity Applicability for Total Emissions Sources Associated with
Weapons Delivery Testing Program at Edwards AFB, California (tons/year)

Emissions Source	NO_2	VOC	PM_{10} (tons/year)	SO_2	CO
Totals					
Alternative A (100 flights)	16.916	3.088	21.585	0.211	18.765
Alternative B (50 flights)	8.458	1.544	10.793	0.105	9.383
Alternative C (10 flights)	1.690	0.309	2.158	0.021	1.875
De minimis thresholds	50	50	70	N/A	N/A
Kern County, MDAB portion of inventory[c]	10,950	4,380	12,410	N/A	N/A
Percentage of Inventory					
Alternative A (100 flights)	0.2	0.1	0.2	N/A	N/A
Alternative B (50 flights)	0.1	<0.1	0.1	N/A	N/A
Alternative C (10 flights)	<0.1	<0.1	<0.1	N/A	N/A

Table 4-2, Page 2 of 2

Notes: a – Does not include emissions above 3,000 feet AGL.

b – When comparing the emissions from the various types of energetic material, the highest one for each criteria pollutant was chosen when calculating the totals. Therefore, CO and NO_2 emissions were taken from the detonation of TNT while the PM_{10} and VOC emissions were taken from the detonation of C4. Particulate emission from the soil displacement and backfilling are also included in these totals.

c – Expected inventory for 2005 based on previous data.

CO – carbon monoxide

LTO – landing and takeoff

N/A – not applicable

NA – not available

NO_x – nitrogen oxides

PM_{10} – particulate matter 10 microns or less in diameter

SO_x – sulfur oxides

VOC – volatile organic compound

The area that would be affected by the emissions shown in Table 4-2 is the immediate area around Edwards AFB, situated in the MDAB portion of Kern County. The Valley portion of Kern County, situated in the San Joaquin Valley Unified Air Pollution Control District, is not included in the conformity applicability analysis because the Valley portion is not anticipated to be affected by the proposed project. Table 4-2 indicates that for all areas the ozone precursor emissions (NO_2 and VOC)

and PM_{10} emissions would be less than the *de minimis* thresholds of 50 tons per year for a serious ozone nonattainment area and 70 tons per year for a serious PM_{10} nonattainment area such as the current MDAB portion of Kern County (40 CFR Part 93 Subpart 153[b][2]). In addition, the emissions of ozone precursors and PM_{10} would not exceed 10 percent of the total Kern County inventories (40 CFR Part 93 Subpart 153[i]). Based on the conformity applicability criteria, the proposed project conforms to the most recent EPA-approved SIP, and no further detailed conformity analysis is required.

In addition, there are no local concerns for CO within the ROI for the proposed project. Emissions from the proposed project would not result in any CO hot spots since traffic congestion and CO nonattainment in the ROI are not local issues.

The proposed project would conform to the most recent U.S. EPA-approved SIP, and emissions from the proposed project would not result in any CO hot spots.

4.1.1.2 Precision Impact Range Area, PB-13 Target

All emissions generated through implementation of the proposed project would be released in the on-base region of Edwards AFB. The emissions generated from the detonation of C4, TNT, Composition B, or similar explosives with a NEW of 500 pounds would not result in significant releases to the atmosphere and would not result in a significant impact to air quality in the region. The emissions would be 0.2 percent or less of the total emissions inventory (NO_2, VOC, and PM_{10}) for Kern County and the MDAB. The detonations would be considered normal operations and not part of OB/OD Plan activities. During range maintenance activities, which would occur after each mission, the detonation in place of a dud or residual explosives by EOD personnel would be conducted as an emergency action, not an activity requiring changes to the OB/OD Plan (Reinke 2004).

4.1.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

4.1.2.1 On-Base Region

On-base impacts under Alternative B would be 50 percent less than those identified under Alternative A.

4.1.2.2 Precision Impact Range Area, PB-13 Target

Air quality impacts generated on the PIRA at the PB-13 target area would be 50 percent less than the impacts identified for Alternative A. Similar to Alternative A, air emissions would be less than

significant. The emissions would be 0.1 percent or less of the total emissions inventory (NO_2, VOC, and PM_{10}) for Kern County and the MDAB. The detonations would be considered normal operations and not part of OB/OD Plan activities. During range maintenance activities, which would occur after each mission, the detonation in place of a dud or residual explosives by EOD personnel would be conducted as an emergency action, not an activity requiring changes to the OB/OD Plan (Reinke 2004).

4.1.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

4.1.3.1 On-Base Region

On-base air quality impacts under Alternative C would be 10 percent of those identified under Alternative A.

4.1.3.2 Precision Impact Range Area, PB-13 Target

Air quality impacts generated on the PIRA PB-13 target area would be only 10 percent of the impacts identified for Alternative A. Similar to Alternatives A and B, air emissions would be less than significant. The emissions would be less than 0.1 percent of the total emissions inventory (NO_2, VOC, and PM_{10}) for Kern County and the MDAB. The detonations would be considered normal operations and not part of OB/OD Plan activities. During range maintenance activities, which would occur after each mission, the detonation in place of a dud or residual explosives by EOD personnel would be conducted as an emergency action, not an activity requiring changes to the OB/OD Plan (Reinke 2004).

4.1.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no impacts on air quality on or near the PB-13 target resulting from the No-Action Alternative.

4.2 AIRSPACE

Any proposed airspace use that requires operating in airspace not approved for that type of activity would result in a significant impact. Impacts would also be considered significant if they resulted in increased risk of aircraft mishaps, permanent changes to flight routes, or restriction of operations at airports.

4.2.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

4.2.1.1 Controlled and Uncontrolled Airspace

Use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not significantly affect the existing controlled and uncontrolled, or navigable, airspace over Edwards AFB because the airspace is a dedicated asset for the use of military and test and evaluation aircraft performing their assigned missions. If an aircraft used to deliver the weapon experienced an emergency situation there could be a temporary reduction in navigable controlled and uncontrolled airspace. In the event of an emergency the pilot would relay requests for assistance to the TRACON via the Central Coordinating Facility (CCF) for controlled and uncontrolled airspace. Emergency situations are evaluated and handled by ATC on a case-by-case basis, with any aircraft experiencing an emergency being afforded priority handling over all other air traffic.

Therefore, impacts on controlled and uncontrolled, or navigable, airspace would not be anticipated under normal conditions.

4.2.1.2 Special Use Airspace

Use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not have any impact on the existing special use airspace.

The weapons delivery aircraft would remain in the R-2515 restricted area in the R-2508 Complex, however, this area would not be adversely affected since accommodating weapons testing aircraft would be considered a matter of routine operations in that special use airspace. The agency using the restricted areas coordinates with the CCF who has the autonomous authority for the R-2508 Complex shared-use airspace. The CCF acts as the single point for coordination of activities with High Desert TRACON and other ATC/mission control facilities. In addition, the flight weapons test represents precisely the kind of activities for which the Restricted Area special use airspace was created in the early 1960s: namely, to accommodate national security and necessary military activities, and to confine or segregate activities considered to be hazardous to nonparticipating aircraft.

Any additional demands that would be placed on existing special use airspace could be accommodated by airspace schedulers. Alternative A would not require assignment of new special use airspace or

modification of existing special use airspace. Consequently, there would be no adverse impacts to special use airspace.

The scheduling office for each special use airspace area (CCF within the R-2515 restricted area) regulates the real-time activity schedule for any Restricted Area, MOA, or Warning Area that would be affected by an emergency. Special use airspace activities may be temporarily affected, but would be readily accommodated by airspace schedulers.

In the event of an emergency, the pilot would relay requests for assistance to TRACON via the CCF for special use airspace. Emergency situations are evaluated and handled by ATC on a case-by-case basis, with an emergency aircraft experiencing an emergency being afforded priority handling over all other air traffic.

4.2.1.3 Military Training Routes

Use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not affect military training routes in the target area. Scheduling the use of R-2508 and the military training routes that transit that airspace is a normal function for the CCF. Therefore, no impacts would occur.

Use of R-2515 restricted area in the R-2508 Complex for weapons delivery testing would not have an adverse impact on military training routes within the complex. Each military training route's "Origination Activity" or home base, which is responsible for communications and coordination with the military aircraft scheduled to use the affected routes, would be notified of the weapons test schedule, and military training would be scheduled to ensure the appropriate separation between aircraft using the military training routes and weapons delivery aircraft. Thus, there would be short-term reductions in the availability of entire training routes, or individual segments. However, the rescheduling of military training route exercises is routine and would not constitute an adverse impact.

During emergency conditions military aircraft would be re-scheduled, or routed around the airspace on a case-by-case basis, whereby an aircraft experiencing an emergency would be afforded priority handling over all other air traffic. Thus, there would be a temporary reduction in the availability of entire training routes, or individual segments.

4.2.1.4 En Route Victor Airways and Jet Routes

Use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not adversely affect the en route airways and jet routes, or general aviation VFR traffic. There are no en route victor airways or jet routes that transect the R-2515 restricted areas in the R-2508 Complex.

General aviation VFR traffic below the R-2508 restricted area (which extends from flight level [FL] 200 to an unlimited altitude) could potentially be affected by weapons delivery testing within the R-2515 Complex. However, as noted above, the impacts would be short-lived and temporary with adequate notification provided by TRACON and local flight service stations. Consequently, there would be no adverse impacts to victor en route airways, jet routes, or general aviation VFR traffic.

4.2.1.5 Airports/Airfields

Use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not adversely affect airports and airfields in the vicinity of the target area. Edwards AFB and Edwards AF Auxiliary North Base are DoD airfields that routinely support military aircraft that carry weapons for training and systems testing and are 8 NM and 10 NM, respectively, from the target site. Borax Private airfield is also 10 NM from the target site. These airfields would be outside the impact area; therefore, no significant impact would result from use of the PB-13 target.

In the event of an emergency the pilot would relay requests for assistance to the TRACON. Emergency situations affecting airports and airfields would be evaluated and handled by ATC on a case-by-case basis. The aircraft experiencing an emergency would be afforded priority handling over all other traffic. Under these emergency conditions there could be a temporary reduction in access to airports and airfields while the emergency aircraft maneuvered to an emergency landing site.

4.2.1.6 Air Traffic Control

Due to the small number of flights anticipated per year, no potential impacts on ATC are anticipated.

4.2.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

The potential for impacts on controlled and uncontrolled airspace, special use airspace, military training routes, en route airways and jet routes, airports/airfields, and air traffic control are discussed below.

4.2.2.1 Controlled and Uncontrolled Airspace

Similar to Alternative A, the use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not significantly affect the existing controlled and uncontrolled, or navigable, airspace over Edwards AFB for the 50 missions proposed under Alternative B. The effect of using controlled and uncontrolled, or navigable, airspace under Alternative B would be 50 percent less than Alternative A. Since there would be no anticipated effect under Alternative A, the effect under Alternative B would also be less than significant under normal conditions.

4.2.2.2 Special Use Airspace

Similar to Alternative A, the use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not significantly affect the existing special use airspace over Edwards AFB for the 50 missions proposed under Alternative B.

The R-2508 and R-2515 restricted areas in the R-2508 Complex would not be adversely affected since accommodating mission aircraft would be considered a matter of routine operations for that special use airspace. The agency using the restricted areas coordinates with the CCF, which has autonomous authority for the R-2508 Complex shared-use airspace. The CCF acts as the single point for coordination of activities with High Desert TRACON and other ATC/mission control facilities.

Any additional demands that would be placed on existing special use airspace could be accommodated by airspace schedulers. Utilization of the PB-13 would not require the assignment of new special use airspace or require the modification of existing special use airspace. Consequently, there would be no adverse impacts to special use airspace.

4.2.2.3 Military Training Routes

Similar to Alternative A, the use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not significantly affect the military training routes that transit the R-2515 restricted area in the R-2508 Complex for the 50 missions proposed under Alternative B. Scheduling the use of R-2508 and the military training routes that transit that airspace is a normal function for TRACON. Therefore, no impacts would occur.

Use of R-2515 and R-2508 restricted areas in the R-2508 Complex for the proposed 50 missions would not have an adverse impact on military training routes within the complex because rescheduling of military training route exercises is routine and would not constitute an adverse impact.

In the event of an emergency landing, each military training route's "Origination Activity" or home base, would be responsible for communications and coordination with the military aircraft using, or scheduled to use, the affected routes. There would be a temporary reduction in the availability of entire training routes, or individual segments.

4.2.2.4 En Route Victor Airways and Jet Routes

There are no en route victor airways or jet routes that transit the region of concern for Alternative B.

4.2.2.5 Airports/Airfields

Similar to Alternative A, the use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not significantly affect airports and airfields in the target area for the 50 missions proposed under Alternative B.

Use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact would not adversely affect airports and airfields in the vicinity of the target area. Edwards AFB and Edwards AF Auxiliary North Base, DoD airfields that routinely support military aircraft that carry weapons for training and systems testing, located 8 NM and 10 NM from the target site. Borax Private airfield is also 10 NM from the target site. These airfields would be outside the impact area; therefore, no significant impact would result from use of the PB-13 target.

In the event of an emergency the pilot would relay requests for assistance to the TRACON. Emergency situations affecting airports and airfields would be evaluated and handled by ATC on a case-by-case basis, whereby an aircraft experiencing an emergency would be afforded priority handling over all other traffic. Under these emergency conditions there could be a temporary reduction in access to airports and airfields while the emergency aircraft maneuvered to an emergency-landing site.

4.2.2.6 Air Traffic Control

Impacts to air traffic control under Alternative B would be similar to those under Alternative A, but with fewer scheduling requirements due to the reduced number of missions.

4.2.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

The use of the PB-13 target for the delivery of armed munitions with a NEW of 500 pounds that detonates on impact during each of the 10 missions proposed by Alternative C would equate to 10 percent of the impacts associated with Alternative A and 20 percent of the impacts associated with Alternative B. Since neither Alternative A nor Alternative B would result in any significant impacts to airspace, and Alternative C would have lower overall impacts than Alternative A or Alternative B, no significant impacts to airspace use would result from implementing Alternative C.

4.2.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no impacts on airspace on or near the PB-13 target resulting from the No-Action Alternative.

4.3 CULTURAL RESOURCES

Cultural resources are limited, nonrenewable resources whose potential for scientific research or value as a traditional resource may be easily diminished by actions that significantly impact the integrity of the property. Potential impacts to historic properties are assessed by applying the Criteria of Adverse Effect as defined in 36 CFR 800.5a. "An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative." The Criteria of Adverse Effect provide a general framework for identifying and determining the context and intensity of potential impacts to other categories of cultural resources, as well, if these are present. Assessment of effects involving Native American or other traditional community, cultural, or religious practices or resources requires focused consultation with the affected group.

Potential impacts to cultural resources associated generally with airspace use include physical damage to buildings, structures, or rock features through accident or vibration, visual or audible impacts to the setting of cultural resources, and disturbance of traditional activities such as religious ceremonies or

subsistence hunting. Impacts to cultural resources from airspace use are most likely to be related to alterations in setting from visual or aural disturbance and the extremely remote possibility of off target detonations or test aircraft crashes.

4.3.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

4.3.1.1 On-Base Region

The Rogers Dry Lake, a National Historic Landmark, is the closest significant cultural resource to the PB-13 target site. The continued use of the landmark in assessing leading-edge space technology enhances its role in the history of technological advances in aviation and aerospace. This asset has been used to support weapons delivery missions for over 50 years. Figure 3-7 identifies a radius of 1 mile from the target where—based on historic uses of the targets—50 percent of the weapons that miss the target are expected to fall. If the target zone is expanded to a 2-mile radius, a 2-mile buffer between the target site and the lakebed is still provided. Considering the improvement in targeting accuracy, weapons delivery techniques, and arming procedures identified by AFFTC and required for all testing and evaluation flights; the probability of weapons landing outside the target zone is extremely remote. Therefore, there would be no adverse effects on this landmark or other known cultural resources in the vicinity of the target area.

4.3.1.2 Precision Impact Range Area, PB-13 Target

Noise levels generated during weapons delivery events would not be anticipated to impact historic buildings, structures, or rock features. The closest non-range building or structure is over 4 NM from the target area.

Effects of Shock Waves on Underground Cultural Resources

In December 2000, approximately 500 pounds of C4 explosive was detonated at the Edwards AFB OB/OD unit of the EOD Range. The soils, vegetation, and wildlife in the test area are consistent with those in the PB-13 target area. The disturbance created by the explosion was consistent with the theory regarding the propagation of shock waves. Shock waves generated from an explosion of this type expend most of the generated energy in an upward direction. As the pressure wave propagates from the point of origin, the amplitude of each wave decreases as 1/r, where r = radius (consistent with conservation of

energy law) (Chorin and Majda 1987). Based on the calculations derived from the software *Calculating Damage and Casualty Areas*, pressure variances from the leading edge shock wave ranges from 200 pounds per square inch (psi) at 10 feet from the detonation to less than 1 psi at 400 feet. The study evaluated the effects of the detonations on the burrows of small mammals and concluded that subsurface damage to the burrows was limited to within 10 feet of the detonation point (for a 500-pound NEW charge) and burrow conditions changed out to 400 feet from the detonation point. The study also concluded that for a 2,000-pound charge, subsurface damage would extend to approximately 20 feet and there would be a change in burrow conditions out to 650 feet. Figure 4-1, created by the software *Calculating Damage and Casualty Areas*, correlates the effects of the shock wave created by the detonation of 500, 1,000, 1,500 and 2,000 pounds of C4. These additional data shows that any shock outside the immediate detonation point would not create a significant impact even for detonations 4 times the maximum NEW of the armed munitions proposed. Since there are no known cultural resources or artifacts in the target area and damage from the shock wave or the detonation is not expected to extend beyond the 500-foot radius of the PB-13 target under normal conditions, impacts to cultural resources are considered to be less than significant.

4.3.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

4.3.2.1 On-Base Region

Opportunities for impacts on the base's cultural resources under Alternative B would be 50 percent less than those identified under Alternative A.

4.3.2.2 Precision Impact Range Area, PB-13 Target

The potential for impacts on cultural resources under Alternative B would be 50 percent of those described for Alternative A. Therefore, impacts on cultural resources under Alternative B as a result of weapons delivery and detonation of bombs, rockets, or mortars containing up to 500 pounds of NEW on PB-13 would not be anticipated.

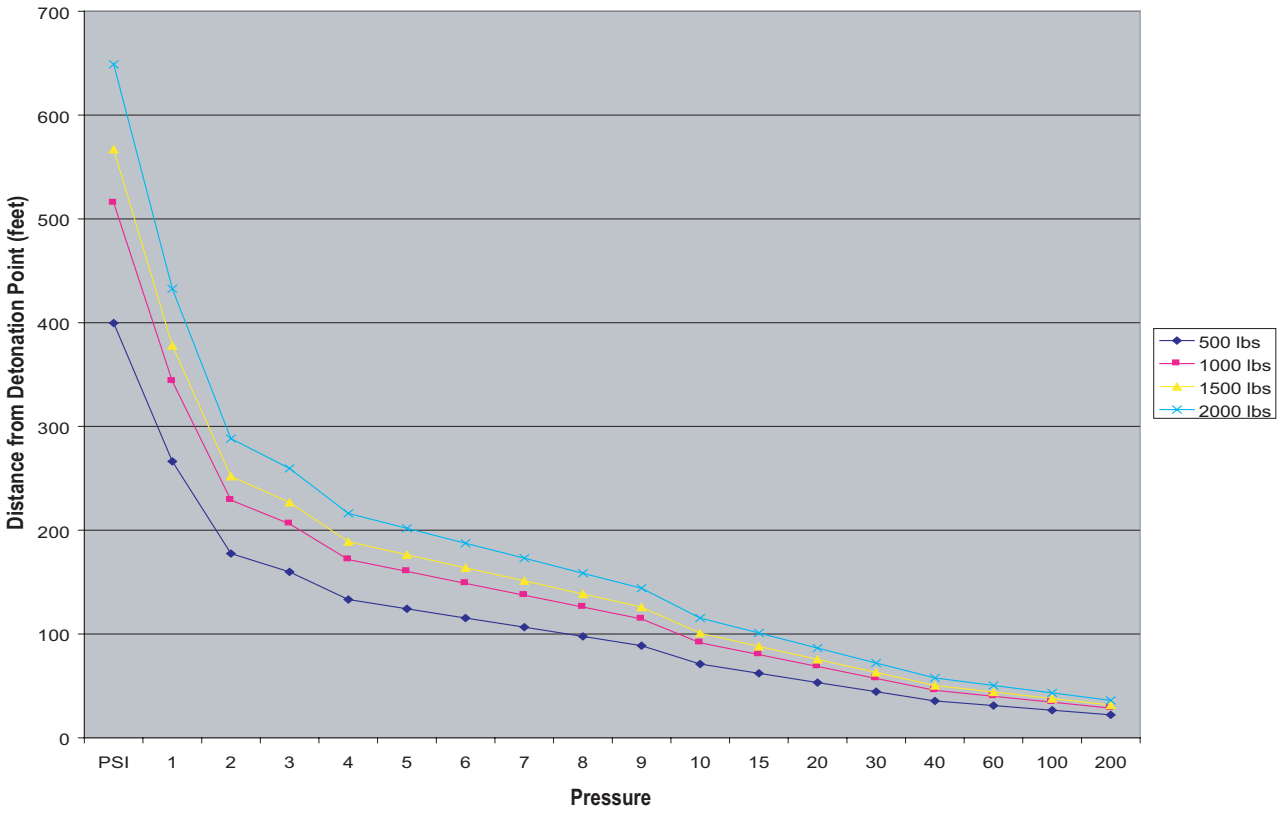


Figure 4-1 Ground Vibration from the Detonation of 500 Pounds of C4

4.3.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

4.3.3.1 On-Base Region

Opportunities for impacts on the base's cultural resources under Alternative C would be 90 percent less than those identified under Alternative A.

4.3.3.2 Precision Impact Range Area, PB-13 Target

The potential for impacts on cultural resources under Alternative C would be 10 percent of those described for Alternative A. Therefore, impacts to cultural resources under Alternative C as a result of a weapons delivery and detonation of bombs, rockets, or mortars containing up to 500 pounds of NEW on PB-13 would not be anticipated.

4.3.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no impacts on cultural resources on or near the PB-13 target resulting from the No-Action Alternative.

4.4 ENVIRONMENTAL JUSTICE

The Environmental Justice Interagency Working Group, mandated by EO 12898, developed guidance for determining whether an impact to human health or the environment would result in disproportionately high and adverse impacts to minority and/or low income populations. The Working Group recommends considering the following six factors to the extent practicable.

1. Whether there is or will be an impact on the natural or physical environment that significantly and adversely affects a minority or low-income population. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities or low-income communities when those impacts are interrelated to impacts on the natural or physical environment.

2. Whether environmental effects are significant and are or may be having an adverse impact on minority populations that appreciably exceeds or are likely to appreciably exceed those on the general population or other appropriate comparison group.

3. Whether the environmental effects occur or would occur in a minority and/or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

4. Whether the health effects, which may be measured in risks and rates, are significant, or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death.

5. Whether the risk or rate of hazard exposure by a minority population or low-income population to an environmental hazard is significant and appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group.

6. Whether health effects occur in a minority population or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

The analysis of this EA supports the conclusion that using PB-13 for testing of weapons delivery systems for bombs, rockets, or mortars containing up to 500 pounds of NEW would have no significant environmental effects. No new development would be required and current Air Force and contractor personnel at Edwards AFB would be used for the program. Thus there would be no disproportionately high or adverse environmental health or safety impacts to minority or low-income populations.

Similarly, the potential to generate disproportionately high environmental health and safety risks (including noise) to children, which must be addressed as required by EO 13045, is less than significant.

4.5 GEOLOGY AND SOILS

A project may result in a significant geologic impact if it increases the likelihood of, or results in exposure to earthquake damage, slope failure, foundation instability, land subsidence, or other severe geologic hazards. It may also be considered a significant geologic impact if it results in the loss of the use of soil for habitat, the loss of aesthetic value from a unique landform, loss of mineral resources, substantially affects the contaminant distribution and fate and transport in soils, or severe erosion, or

sedimentation. Normal military T&E activities conducted at Edwards AFB do not contribute to exposure to earthquakes or other severe geologic hazards. The region of influence for soils and geology includes PB-13 and the area immediately surrounding the target.

4.5.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

Under Alternative A, PB-13 would be a designated an armed munition only target with a capacity of 100 weapons delivery events per year. No construction activities or relocation of existing PIRA facilities would be required. Armed munitions T&E would be conducted using air-to-ground and ground-to-ground missions. No off-road use of vehicles would occur while conducting ground-to-ground T&E of armed munitions.

There would be no adverse, significant impacts on soils or geology on or near the PB-13 target from the proposed testing. The use of PB-13 for armed munitions testing would not increase the likelihood of—or result in exposure to—earthquake damage, slope failure, foundation instability, land subsidence, or other severe geologic hazards. The proposed testing would not result in the loss of soil used for habitat, loss of aesthetic value from a unique landform, loss of mineral resources, severe erosion, or sedimentation. Potential soil contamination would be reduced to a level that is less than significant through current range maintenance practices. Additionally, fragments and debris would be removed from the target prior to backfilling the crater that would be formed from the detonation of armed munitions. Specific mitigation for the Proposed Action will include clearing the target area of any duds after each mission and before any additional armed munitions are dropped on the target. Therefore, no significant impacts on soil contamination and fate and transport would be anticipated.

The PB-13 target and the land area surrounding it are highly disturbed and lack surface vegetation. The area is subject to wind erosion. The target has not been used since July 2000 when a total of 18 weapons hit the ground. The proposed testing would be a continuation of ground disturbing activity that has occurred in the past, although the proposed testing is with armed munitions. The shape of the crater formed (e.g., the width and depth) on detonation will vary with the type of armed munition tested.

In December 2000, 487.5 pounds of C4 explosive were detonated at the Edwards AFB OB/OD site of the EOD Range. The detonation was conducted to provide data as part of obtaining a RCRA Part B/Subpart X permit to operate the site. The C4 detonation created two concentric craters: one approximately 7 feet

in diameter and 1 foot deep was formed and was surrounded by an outer crater 20 feet in diameter and 2 inches deep with a 3-inch sandy berm. Subsurface damage was limited to an area within a 9.8-foot radius directly around detonation point. Pressure calculations derived from EOD software show that detonations of up to 2,000 pounds would create subsurface damage directly under the detonation point and extend outwardly approximately 19.8 feet (Anton and Ronning 2000).

Craters formed at the PB-13 from the 500-pound NEW detonation would be backfilled following the completion of a weapons delivery test and the surface would be graded. The target area would be cleared of any duds after each mission and before any additional weapons were dropped on the target. Therefore, the proposed testing is expected to have a negligible effect on the rate of soil erosion.

When an armed munition is detonated, it produces physical effects as well as chemical by-products. The physical effects are noise, overpressure, and seismic vibration (see Sections 3.10 and 4.10). Detonation of a 500-pound NEW armed munition would result in fragmentation and dissemination of the casing as shrapnel over an approximately 2,000-foot radius from the detonation point; fragments would go outside the 1,000-foot diameter graded surface of PB-13. The shrapnel produced by the blast fragmentation of an armed munition has the potential for greater physical damage (to humans and other biological receptors) than chemical effects, although the fragments would undergo chemical changes after reaching the surface. The fragments corrode and create oxides over time. The combustion of explosives results in chemical and air emissions as identified in Section 4.1. The potential also exists that the explosive material would not undergo complete combustion (due to malfunction) and could reach the environment as the unaltered explosive material.

Missiles/rockets are much more complex, but have less NEW than armed munitions. Missiles are powered by some form of propellant and equipped with guidance systems to improve precision and accuracy. This results in slightly more debris and no changes in chemicals that could potentially enter the environment. The combustion of the missile/rocket fuel produces the same products (carbon dioxide, CO, and NO_x) that are produced by the combustion of explosive material. The products of missile/rocket use are debris, metal fragments, carbon dioxide, carbon monoxide, and nitrogen oxide.

The use of explosives in armed munitions and other devices will release only minimal amounts of the original, unaltered explosive into the environment if the munition functions properly, resulting in complete combustion (Becker 1995). However, if the explosive is not fully combusted due to a malfunction (e.g., duds) then explosives can reach the environment.

Explosives that are commonly used include TNT, HMX, and RDX and their derivatives (refer to Table 3-10). The derivatives are either combinations of these explosives or are altered through the addition of plastic binder or aluminum. Literature studies clearly demonstrate that when an explosive is detonated and undergoes complete combustion, the major chemical products that are generated are carbon dioxide, carbon, CO, water, and NO_x. None of these combustion products is expected to have detrimental effects on the environment. They are dispersed in the atmosphere and may be dissolved in atmospheric water. They are carried by wind off the base and may be deposited on soil, plants, and surface water by rainfall.

The mobility of TNT, HMX, and RDX in soils is dependent on soil characteristics such as texture (e.g., percent clay), percent organic carbon, and cation exchange capacity. TNT is highly water-soluble and degrades rapidly into by-products (including 2,4-dinitrotoluene and 4,6-dinitrotoluene) in air and water. TNT does not adsorb (chemically bind) to most soils and with sufficient rainfall and moves rapidly through the soil column (U.S. Army 2003). Microbial degradation does not proceed rapidly (Marine Environmental Support Office 1999). RDX is not highly water soluble and does not absorb (chemically bind) to most soils. The adsorption of RDX is directly related to the clay content. With sufficient rainfall, residual nondegraded RDX and secondary products will move rapidly through soils and into the ground water (U.S. Army 2003). The photolysis of RDX is rapid with a half-life of photolysis of about 17 days. HMX is not considered as potentially toxic as other explosives and is less mobile in water and soils (Marine Environmental Support Office 1999; U.S. Army 2003).

Ammonium perchlorate and potassium perchlorate have been used in a variety of munitions and pyrotechnics. Only small amounts of perchlorate are found in weapons systems. Perchlorate is a highly mobile and persistent compound with high solubility and chemical stability in groundwater (U.S. Army 2003).

Previous tests conducted at PB-13 have resulted in the contamination of soils by explosives. Specific mitigation for the Proposed Action would include clearing the target of any duds after each mission and before any additional weapons are dropped on the target. Additionally, fragments would be periodically cleared according to range maintenance policy and AFI 13-212, minimizing environmental contamination from corrosion and degradation of fragments and debris. Fragments and debris will be cleared from the target area prior to backfilling the crater. With implementation of these procedures, impacts on soil contamination will be mitigated to a level that is less than significant.

4.5.2 Mitigation Measures

Specific mitigation for the Proposed Action will include clearing the target of any duds after each mission and before any additional armed munitions are dropped on the target. Fragments and debris will be cleared from the target area prior to backfilling the crater.

4.5.3 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

The potential impacts on soils and geology from implementation of Alternative B would be similar to those described for Alternative A. The impacts would be reduced under Alternative B because there would be fewer armed munitions delivery events. Mitigation would be the same as that described for Alternative A.

4.5.4 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

The potential impacts on soils and geology from implementation of Alternative C would be similar to those described for Alternative A. The impacts would be reduced under Alternative C because there would be fewer armed munitions delivery events. Mitigation would be the same as that described for Alternative A.

4.5.5 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no impacts on soils or geology on or near the PB-13 target resulting from implementing the No-Action Alternative.

4.6 HAZARDOUS WASTE/HAZARDOUS MATERIALS

A project may result in a significant hazardous waste/hazardous materials impact if it increases the potential for exposure to hazardous waste/hazardous materials or increases the likelihood of a hazardous materials release to the environment. Impacts to hazardous materials and waste management would also be considered significant if they resulted in noncompliance with applicable regulatory guidelines or increased the amounts generated beyond available waste management capacities.

Impacts to solid waste would be considered significant if they resulted in noncompliance with applicable regulatory guidelines or increased the amounts generated beyond available waste management capacities.

4.6.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

The primary hazardous materials required for the weapons delivery aircraft include JP-8 and other petroleum, oils, and lubricants. Management of these materials associated with weapons delivery aircraft launches, recoveries, and servicing are governed by Air Force instructions. When the delivery aircraft are on the runway and flightline hazardous materials and hazardous waste are managed per the requirements of the AFFTC Hazardous Waste Management Plan. If a spill occurred, the hazardous waste would be cleaned up in accordance with the AFFTC SPR Plan 32-4002, *AFFTC Oil and Hazardous Substance Spill Prevention and Response Plan*. The handling and storage of the weapons is conducted in accordance with the explosive safety procedures contained in Air Force Manual 91-201, *Explosive Safety Standards*. Munitions are stored and handled on the flightline in specified areas subject to strict management. Each location where live ordnance is stored or handled has a clear zone. The minimum clear zone for a 500-pound NEW armed munition in an aircraft parking area is approximately 240 feet (DoD Directive 6055.9).

The Air Force's Class A flight mishap rating for 2003 was 1.39 mishaps per 100,000 flight hours (Air Force Association Magazine 2004). The probability of a crash of the weapons delivery aircraft is extremely remote. Since the probability of a crash is remote, impacts to on-base hazardous waste within IRP sites are not anticipated. If a crash occurred, Edwards AFB would be responsible for disposing of the debris and a less than significant impact to solid waste would occur; however, because the probability of a crash is low, impacts to solid waste are not anticipated.

There would be no adverse, significant impacts on hazardous waste or hazardous materials resulting from the use of the PB-13 target for weapons delivery of bombs, rockets, or mortars containing up to 500 pounds of NEW fill. The primary hazardous contaminants likely to be released include TNT and RDX. Lesser amounts of a number of other nitroaromatic compounds found in other munitions may be used as fuses and primers (see Table 3-10). It is important to note that the detonation process, including the continued combustion that occurs in the plume immediately after the initial detonation, results in nearly complete combustion of these explosive compounds to form oxides of carbon, nitrogen, and water. Thus, it is unlikely that significant quantities of the parent explosives compounds or the combustion

products (as shown by the small volume of emissions in Table 4-2) would be released to the environment from armed munitions delivery events.

Additional materials such as shrapnel and other debris (solid waste) would be left on the PB-13 target area. Range maintenance procedures dictate that range personnel remove pieces of shrapnel and debris from the target area as part of regularly scheduled cleanup activities (AFFTC 2001). These pieces of debris would be recycled through the Defense Reutilization and Marketing Office or sent to the landfill for disposal and would not be considered a significant impact to solid waste management activities.

4.6.1.1 Mitigation Measures

Although the detonation process results in nearly complete combustion of the NEW fill, EOD personnel will sweep the target area after each armed munitions delivery event to ensure any remaining explosives are removed or are fully detonated prior to the next armed munitions delivery event. As a result of these actions and the continued implementation of standardized hazardous waste/hazardous material/solid waste management procedures, no significant impacts are likely to occur.

4.6.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

Impacts to hazardous waste/hazardous materials and solid waste under Alternative B would be identical to those described under Alternative A.

4.6.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

Impacts to hazardous waste/hazardous materials and solid waste under Alternative B would be identical to those described under Alternative A.

4.6.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no impacts on hazardous waste/hazardous materials on or near the PB-13 target resulting from the No-Action Alternative.

4.7 INFRASTRUCTURE

A project may have significant effects on a public utility if it increases demand in excess of utility system capacity to the point that substantial expansion becomes necessary. Significant environmental impacts could also result from system deterioration due to improper maintenance or extension of service beyond its useful life. Destruction or damage of infrastructure would also be considered a significant impact.

Up to 10 additional personnel may be required to provide support for weapons testing activities on a temporary basis. As such there would not be any demand on the infrastructure that could not be met by the capacities of the current systems. No additional expansion would be required to support the Proposed Action or Alternative B or C.

There would be no impacts to the utility systems (energy resources, water supply, wastewater treatment, stormwater treatment, electrical distribution, natural gas, communication, or transportation) from implementation of Alternative A, B, or C.

4.8 LAND USE

An impact to land use would be considered significant if the project resulted in nonconformance with approved land use plans; a decrease in visual or aesthetic resources; or a conflict with environmental plans or goals, permit requirements, or existing uses of the project area or other properties.

4.8.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

Use of PB-13 for armed munitions testing as proposed in this EA would not result in adverse, significant impacts on land use. The proposed testing would not conflict with approved land use plans, environmental plans or goals or other testing programs conducted on the PIRA. There would be no effects on visual or aesthetic resources on the PIRA or the flat plains that make up the West Range where PB-13 is located. The target area would continue to be maintained in accordance with AFI 13-212, *Range Operations and Planning*. Consequently, implementation of Alternative A would have no significant impacts on land-use and no mitigation would be required.

4.8.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

Impacts on land use and visual and aesthetic resources under Alternative B would be similar to those under Alternative A. Disturbance near the target would be less frequent with a limited capability of 50 weapons delivery events per calendar year rather than 100 events. Under Alternative B, there would be no adverse, significant impacts on land use or visual and aesthetic resources from the proposed armed munitions testing.

4.8.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

Impacts on land use and visual and aesthetic resources under Alternative C would be similar to those under Alternative A. Disturbance near the target would be less frequent with a minimum capability of 10 weapons delivery events per calendar year rather than 100 events. Under Alternative C, there would be no adverse, significant impacts on land use or visual and aesthetic resources from the proposed armed munitions testing.

4.8.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no impacts on land use or on visual or aesthetic resources on the area near PB-13 or on the PIRA from the proposed armed munitions testing.

4.9 NATURAL RESOURCES

Impacts to natural resources would be considered significant if they resulted in harm, harassment, or destruction of any endangered, threatened, or rare species including a species proposed for listing, candidate species, or species considered sensitive by resource agencies or organizations (e.g., California Department of Fish and Game, CNPS). This would include impacts to designated critical habitat, migratory birds, wildlife migration corridors, or breeding areas. The loss of a substantial number of individuals of any native plant or animal species that could affect abundance or diversity of that species beyond normal variability is also considered significant. Any impacts to sensitive habitats may be considered significant. The region of influence for impacts on natural resources from the proposed armed munitions testing would be Runway 22 and the area immediately surrounding target PB-13. The Air

Force is undergoing formal consultation with the USFWS to prepare a Biological Opinion for the proposed testing of armed munitions.

Wildlife response to noise can be physiological or behavioral. Physiological effects can be mild, such as an increase in heart rate, to more severe, such as effects on metabolism and hormone balance. Mild behavioral responses include head raising or body shifting, and more severe responses are typified by nest abandonment. Long-term exposure to noise can cause excessive stimulation to the nervous system and chronic stress that is harmful to the health of wildlife species and their reproductive fitness (Fletcher 1980, 1988).

4.9.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

Alternative A would use Runway 22, which is a hard surface runway. No construction activities would be required for use of the runway or use of the target. The runway is routinely used and is the Main Runway on base. No loss of habitat would be anticipated. Rogers Dry Lake is not within designated critical habitat for the desert tortoise or within any SEA. Target PB-13 is a clear, graded surface that is devoid of vegetation. It is not within designated critical habitat for the desert tortoise or within any SEA. There are no associated wetlands or riparian areas. Sensitive species and their habitat, including desert tortoise and its designated critical habitat and SEAs, would not be impacted by Alternative A.

The major mechanisms or chemical transfer to biota are through direct contact (e.g., deposition of particulates onto the fur and feathers of animals or the leaves and canopies of plants), inhalation or absorption (dermal, root, or foliar) of gases and particulates, and ingestion (e.g., contaminated soil particles, contaminated water, or contaminated vegetation). Target PB-13 and the area immediately surrounding the target are devoid of surface water and vegetation. Detonation of armed munitions would result in the deposition of explosives on soil particles around the target area. Direct contact with and ingestion of explosives-contaminated soil is the main exposure mechanism for ecological receptors near PB-13. Some soil particles would be transported from the target area during periods of surface runoff.

The releases of air emissions identified in Table 4-2 are not considered significant. If explosives are properly detonated and full combustion occurs, the amount of explosives that would enter the environment are insignificant. Carbon dioxide, CO, and NO_x produced by the combustion of munitions are dispersed in the atmosphere and are not distinguishable from the carbon dioxide, CO, and NO_x

produced by other sources. A small fraction of these gases dissolves in atmospheric moisture and is transported by weather patterns, eventually being deposited on the earth's surface by precipitation.

The possibility of incomplete combustion and malfunction (i.e., duds) could result in the release of raw materials into the environment immediately surrounding PB-13. However, specific mitigation for the proposed armed munitions testing is the clearance of any duds following each test and before any additional weapons are dropped on the target. Therefore, impacts on natural resources from the potential air emissions or chemical releases generated by armed munitions testing are considered to be less than significant.

Aircraft generate noise and visual disturbance. The heights from which armed munitions would be dropped and flight patterns used during testing operations would be variable as would the type of aircraft used. The weapons delivery aircraft would remain in the R-2515 restricted area in the R-2508 Complex (see Sections 3.2 and 4.2). Methods that have been used at Edwards AFB to control the bird air strike problem with horned larks include revegetation with native plants and use of a falconer.

Testing-related noise, particularly armed munitions testing, would be a source of disturbance to wildlife. PB-13 is an established target and a disturbed area, and the PIRA is an established bombing range. The armed munitions testing would create a sporadic rather than continual disturbance near PB-13. There is a strong tendency for species to acclimate or habituate to a repetitive noise disturbance.

Studies on the effects of noise on wildlife caused by aircraft overflights and impulse noise such as sonic booms have been focused on birds, including raptors, bighorn sheep, and small mammals (Oak Ridge National Laboratory 2000). It has been shown that occasional, low-altitude overflights can produce increased heart rates in hoofed mammals, but the effect was not found to be detrimental. Low-altitude military overflights have the potential to impact the hearing thresholds of some rodent species. Birds, on the other hand, appear to be unaffected by both the low-level aircraft overflight noise and sonic booms. In one study, a researcher observed a raptor species hunting on a bombing range in Mississippi. The species appeared to be unaffected by the military exercises, even when a bomb exploded within approximately 200 feet. In another study, raptors were found to rapidly habituate to aircraft overflights. No significant noise impacts on wildlife are expected from weapons delivery on the PB-13 target area (Oak Ridge National Laboratory 2000).

Anthropogenic noise can impact desert tortoises in several ways including damage to the auditory system and disruption of communication. Noise studies on tortoises have shown very little behavioral or

physiological effect on tortoises from loud noises that simulated jet overflights and sonic booms. Two threshold values (i.e., lowest observed adverse effects level) available for the effects of sound on desert tortoises are 95 dB CSEL and 115 dB CSEL (Oak Ridge National Laboratory 2000). These values were obtained through repeated, continuous noise exposures up to 40 minutes in length rather than infrequent blast noise. The changes in behavior were exhibited by a decrease in activity.

The desert tortoise can occur in almost every desert habitat, but is most common in desert washes, desert scrub, creosote bush, and Joshua tree habitats. Because target PB-13 is generally devoid of vegetation, tortoises are not expected to be present on the target but could occasionally transit through the area. Desert tortoises mate in the late spring and the early summer (usually April to July). The tortoises are most active in California during the spring and early summer when annual plants are most common. Additional activity occurs during the warmer fall months and occasionally after summer rainstorms. They spend the remainder of the year in burrows, escaping extreme desert conditions (AFFTC 2002). Tortoise densities were found to be low to very low throughout Edwards AFB and approximately 80 percent of the base has densities at or below 20 tortoises per 1 square mile (AFFTC 2002). Desert tortoises also appear to be unaffected by noise even up to levels over 100 dBA (U.S. Army 2004). Target PB-13 is located within Zone 1 of the desert tortoise management area; activities within this zone are not expected to preclude the recovery of the desert tortoise in the Western Mojave Desert. Since tortoise density is low in the area surrounding PB-13, direct impacts to the desert tortoise from armed munitions testing would be very unlikely.

4.9.1.1 Mitigation Measures

Specific mitigation for the proposed armed munitions testing will include clearing the target of any duds after each mission, and before any additional weapons are dropped on the target. Fragments and debris will be cleared from the target area prior to backfilling the crater.

4.9.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

Impacts under Alternative B would be similar to those described for Alternative A. However, there would be reduced impacts from ground disturbances, noise, and aircraft due to the reduced number of missions.

4.9.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

Impacts under Alternative C would be similar to those under Alternative A and B. However, there would be reduced impacts from ground disturbances, noise, and aircraft because there would be only 10 missions per year.

4.9.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no impacts on natural resources on the area near PB-13 or on the PIRA from the proposed armed munitions testing.

4.9.5 Mitigation Measures

Since impacts to natural resources would be less than significant under Alternative A, B, or C, no mitigation would be required.

4.10 NOISE AND VIBRATION

Noise impact criteria are based on land use compatibility guidelines and on factors related to the duration and magnitude of noise level changes. Annoyance effects are the primary consideration for most noise impact assessments. Because the reaction to noise level changes involves both physiological and psychological factors, the magnitude of a noise level change can be as important as the resulting overall noise level. The local residents would often consider a readily noticeable increase in noise levels a significant effect, even if the overall noise level was still within land use compatibility guidelines. On the other hand, noise level increases that are unnoticed by most people are not considered a significant change, even if the overall noise level is somewhat above land use compatibility guidelines. Some potentially significant thresholds include the following:

- An L_{DN} of 65 dBA, or a CDNL of 61 C-weighted decibels (dBC) for sonic booms, is the generally accepted limit for outdoor noise levels in residential areas for land use planning and long-term annoyance factors (U.S. Army 2001). Project-related noise levels 5 dB or more above 65 dBA or above 61 dBC would be considered a significant impact.

- Frequent occurrence of a CSEL greater than the generally accepted limit for outdoor noise levels of 61 dBC.

- Weapons related dBP sound levels above 130 dBP pose a high risk of noise complaints with the possibility of damage to windows, bric-a-brac, and plaster.

If the vibration levels exceed the recommended levels set by the U.S. Bureau of Mines of 0.5 inch per second at the receiver site as a result of the 500-pound NEW detonation it would be considered a significant impact (Fort McCoy 2003).

4.10.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

4.10.1.1 Noise

While the proposed action would establish a limit of 100 detonations per year for armed munitions with 500-pounds of NEW at PB-13, it is unlikely that all 100 armed munitions tested would contain 500 pounds NEW fill (Hagenauer 2004). Advances in modern warfare capabilities have made it possible for surgical strikes to take out specific targets while reducing collateral damage and civilian casualties. With this focus on the use of precision armed munitions like the Hellfire missile with a NEW of 34.4 pounds, referred to in Section 1.5, many of the armed munitions to be tested would probably contain lower NEW with lower dBP and a lower probability of complaints.

The BNOISE2 program was used to analyze and determine the effect of noise that would result from the detonation of 500 pounds of NEW fill. The MK 83 general-purpose bomb was used because it is the only bomb in the current DoD inventory that contains the amount of explosive material that approximates the maximum NEW test parameters. The MK 83 weights approximately 1,000 pounds and contains approximately 445 pounds of NEW (TNT equivalent). Five meteorogical (acoustic propagation) cases were evaluated. A DNL (Ldn [A]) of 65 dBA or lower is considered to be acceptable (Table 4-3); a DNL above 65 dBA but not exceeding 75 dBA is normally unacceptable unless some form of noise attenuation

is provided. Daily exposure to CDNL of 61-dB or less is compatible to the DNL 65 dBA significance level for non-impulsive noise and is normally considered compatible with most land uses.

The Day Focus (Ldn [A]) contours shown in Figure 4-2 provides the 60 dBA Ldn and 70 dBA Ldn, the condition that results in the largest area affected by the noise from the detonation. The 70 dBA contour extends to 310 feet, the 60 dBA contour extends to 1,060 feet, and 24 dBA contour extends to 1.7 miles (Base boundary) from the detonation point, well within the limits of the land use compatibility guidelines for noise.

Different weather conditions affect sound propagation. The distances from the detonation point for other weather conditions are provided in Table 4-4.

Table 4-3

Relationship Between C-Weighted and A-Weighted Sound Levels and Percent of the Population Highly Annoyed

CDNL (C-weighted)	% Highly Annoyed	DNL (A-weighted)
48	2	50
52	4	55
57	8	60
61	14	65
65	23	70
69	35	75

Note: CDNL can be interpreted in terms of "equivalent annoyance" DNL.

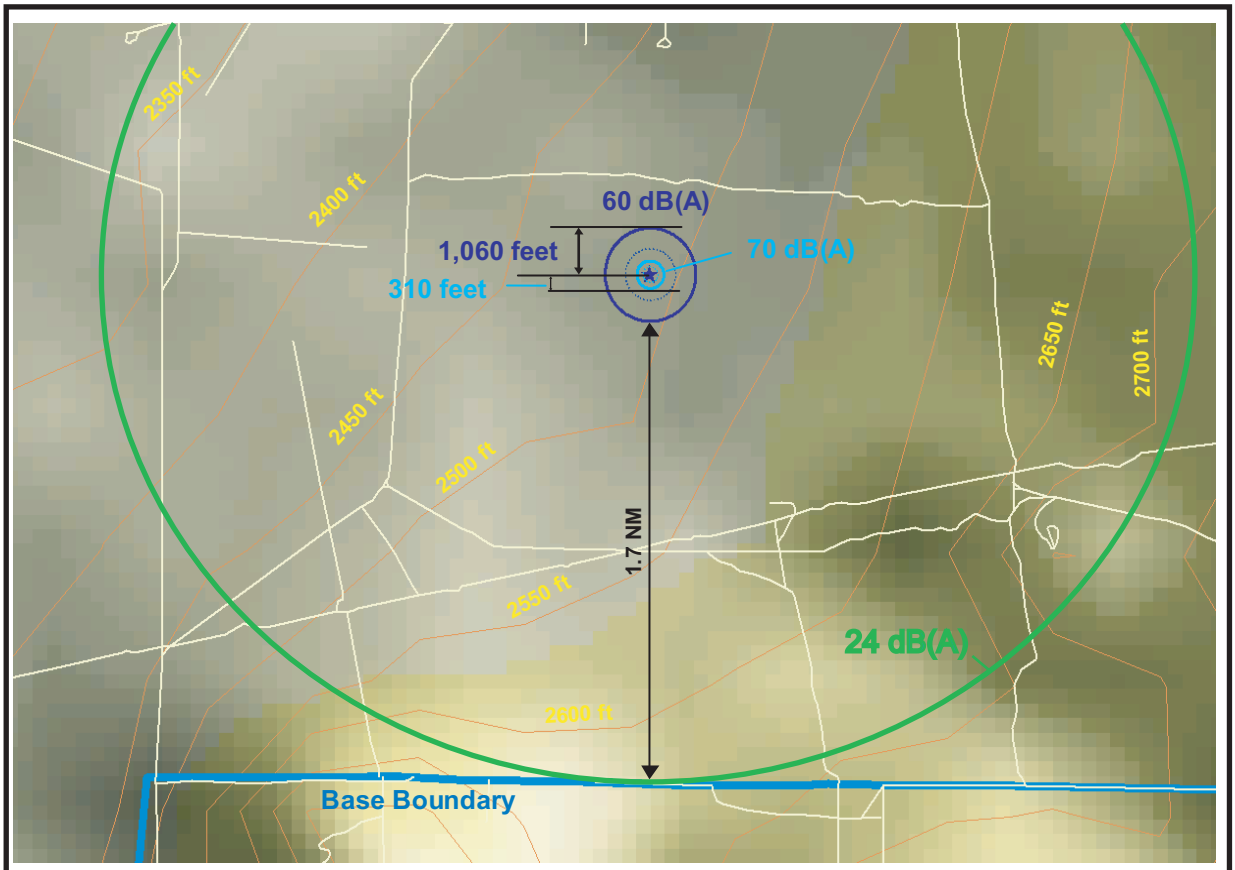
Table 4-4

Ldn (A) Contours for Different Weather Conditions

Weather Condition	60 dBA Radius (feet)	70 dBA Radius (feet)
Day focus	1,060	310
Day base	600	200
Desert	500	160
Day negative gradient	320	100
Excess day negative gradient	60	20

Source: ACTA 2004

The sound levels (dBP) created from the detonation of the MK 83 general-purpose bomb are shown in Table 4-5.



dB(A)
24.0000000
60.0000000
65.0000000
70.0000000
75.0000000

LEGEND

Elevation: 2,426 ft msl

Elevation Contours

0 0.5 1.0

Scale in Nautical Miles

Target Center
117 °44.17´ W 34°51.3´ N

Environmental Assessment for Armed Munitions Integration Testing on the Precision Impact Range Area

Test Site Day Focus Ldn(A) Contours for a 500-pound NEW Detonation at PB-13

DATE	FILE NO.	FIGURE NO.
6/09/04	Q238/FIGURES/ 3-14.ai	4-2

Table 4-5

Sound Levels for Various General Purpose Bombs

Type of General Purpose Bomb	MK 82	MK 83	MK 84
Total Bomb Weight (pounds)	500	1,000	2,000
Net Explosive Weight (pounds)	192	445	970
Range from Target (feet)	Sound Level (dB Peak)		
6,561.5	148.5	150	153
13,123.2	138.0	141	143
26,246.4	130.5	133	135.5
52,492.8	123.0	125.5	128
78,739.2	118.5	121	123
118,108.8	113.5	116	118.5

Source: Russell 2004

These unweighted peak values show that the sound levels at 52,492 feet (8.7 NM) to 118,109 feet (19.78 NM) could result in a moderate risk of noise complaints (Table 4-6) for the MK83 general-purpose bomb, which contains 445 pounds of NEW.

Table 4-6

Guidelines for Evaluating Peak Blast Sound Levels

Sound Levels (dB Peak)	Risk of Noise Complaints
<115	Low
115–130	Moderate
130–140	High, and possibility of damage
>140	High risk of physiological and structural damage claims

Source: Pater 1976.

Peak sound levels resulting from blasts (detonations) are similar to sound levels created by sonic booms. Annually over 600 supersonic flights and associated sonic booms with peak overpressure in the 1.31 to 2.54 psf range, as shown in Table 4-7 (calculated by USAF Boom 10C, *Sonic Boom Calculations for Steady State Flight Conditions* 2003) occur in the local Edwards AFB area (AFFTC 2001).

Table 4-8 shows a comparison of the SEL values (dBA and dBC) in relation to peak overpressure and unweighted peak sound power level (dB). Examination of the data in Table 4-8 shows that the CSEL values for sonic booms overpressures that occur at 1.0 to 2.0 psf produce an unweighted peak SPL that is equivalent to the moderate risk of noise complaint shown in Table 4-6.

Table 4-7

Peak Overpressures and Sound Levels for Test Aircraft at FL 300 at Mach 1.5

Aircraft	Peak Overpressure (psf)	CSEL (dBC)
F—15 C/D	2.43	109.3
F15E	2.54	109.7
F-16	1.79	106.6
F-18	2.20	108.4
T-38	1.31	103.9
F-22	2.38	109.1

Source: Boom 10C 2003

Table 4-8

Relationship between Sonic Boom Overpressure and Sound Levels

Peak Overpressure (psf)	CSEL (dBC)	Peak SPL (dB)	SEL (dBA)
0.2	85.4	113.6	75.9
0.5	94.0	121.6	84.5
1.0	100.4	127.6	90.9
2.0	106.9	133.6	97.4
3.0	110.7	137.1	101.2
4.0	113.4	139.6	103.9

Source: AFFTC 2003

The CSEL values for the sonic booms created by supersonic aircraft operating in and around Edwards AFB (Table 4-7) would produce an equivalent risk of noise complaints in the moderate to high range. Results from the actual monitoring of noise complaints (which are often just inquiries) show that Edwards AFB averages less than 15 noise complaints per year.

The noise values SEL (dBA) created from the simulated detonation of the MK-83 general-purpose bomb were calculated to be 60 dBA at 7.4 miles, 70 dBA at 4.3 miles, and 80 dBA at 2.8 miles from PB-13. These values would equate to peak SPL values and CSEL values similar to those produced by sonic booms from test aircraft.

Small communities located within 20 miles of PB-13 include: Hi Vista, Boron, Edwards, North Edwards, Wilsona Gardens, Kramer Junction, Redman, Bissell, and El Mirage; however the expected sound levels for the detonations do not exceed 130 dBP for any of these communities. Many of the residents in these small communities work on the base. The closest industrial or residential buildings are 19,800 feet (3.3 NM) from the impact area. The personnel in the buildings at Downfall (Range Control Station) directly support range operations and would be involved in ongoing missions. It is unlikely that any noise

complaints would come from this on base area or the residents in the local communities. However, to preclude and minimize the occurrence of any noise complaints mitigation measures would be implemented as identified in Section 4.10.1.3.

4.10.1.2 Noise Impacts on Wildlife

No significant noise impacts on wildlife are expected from weapons delivery on the PB-13 target area (see Section 4.9).

4.10.1.3 Mitigation Measures

Although there is a moderate risk of complaints that could result from detonation of bombs, rockets, or mortars containing 500 pounds of NEW, the local communities are acclimated to the noise related to testing that occurs at Edwards AFB. Edwards AFB will continue to monitor noise complaints and will provide a general notification of impending detonations if a substantial increase of complaints occurs.

4.10.1.4 Vibration

There are no structures or buildings within 2.5 miles of the PB-13 target. Based on an Army study (Fort McCoy 2003), the maximum ground vibration for a 500-pound NEW bomb at 2.5 miles from the detonation would be 0.00333 inch per second—well below the level that would be considered significant and below 0.08 inch per second, the level where vibration would be perceived by humans (Table 3-16). Detonation tests of 500 pounds of C4 at the OB/OD site on North Base showed that the ground vibration effect ended at approximately 400 feet from the detonation site (Figure 4-1); and had no effect on the habitat of small mammals.

Therefore, vibrations resulting from the implementation of Alternative A would result in less than significant impacts; no mitigation would be required.

4.10.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

The environmental effects of noise and vibration as a result of implementing Alternative B would be half that of Alternative A. Therefore, no significant impact would result from implementing this alternative.

4.10.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

The environmental effects of noise and vibration as a result of implementing Alternative C would be 10 percent of the effects resulting from Alternative A. Therefore no significant impact would result from implementing this alternative.

4.10.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no noise related impacts on the area near PB-13 or on the PIRA from the proposed armed munitions testing.

4.11 PUBLIC/EMERGENCY SERVICES

An impact to public/emergency services would be considered significant if it resulted in slower response times by fire protection services, security services, or medical services or failure of these services.

Under normal test conditions there would be no environmental effects or significant impacts on public/emergency services as a result of implementing any of the proposed alternatives. All activities would occur on base. If simultaneous emergencies occurred there could be a slower response by fire protective services, security services, or medical services; however the organizations that provide these services routinely evaluate and practice responding to multiple emergency situations. Because test plans would only allow for single events, the opportunity for simultaneous events to occur would be minimized. As a result, the probability of an environmental effect that would impact public and emergency services if the proposed actions were implemented would be less than significant.

4.12 SAFETY

A safety impact would be considered significant if it created a potential public health hazard or involved the use, production, or disposal of materials that pose a hazard to people.

4.12.1 Alternative A—Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

The AFFTC's Hazardous Communication Program and Institutional Safety and Occupational Health programs would be followed to reduce the potential for any risk to health and safety from Weapons Delivery on the PIRA Program activities. Because construction of new facilities, including facilities emitting electromagnetic radiation (EMR) or lasers, would not be required for the program, impacts to on-base health and safety under normal conditions would not occur.

In the event of an accident, AFFTC would be required to comply with Occupational Safety and Health and Administration regulations and AFFTC's Emergency Response Plan. The crash of the weapons delivery aircraft or unintentional dropping of the weapons off target could cause casualties and loss of property. However, strict guidelines and flight procedures have shown the probability of such an occurrence is extremely rare for this type of preplanned event. Historically, there is no information on mission-related aircraft accidents that may have taken place on the PIRA, however an estimation of aircraft mishap rates in 1996 suggested that a Class A mishap (a mishap that resulted in at least $1,000,000 loss or the loss of one life) would occur every 4.28 years. Test aircraft like the F-15, F-16, F-18, and T-38 have annual Air Force wide Class A mishap rates of 2.53, 4.5, 3.45, and 1.58 per 100,000 flight hours, respectively. Then last recorded Class A mishap occurred at Edwards AFB in 2001 and involved an F-16 aircraft. These accident rates are not considered significant (AFFTC 1996).

Prior to each weapons delivery event the Range Safety Office (412 TW/ENROR) is required to complete a weapons safety footprint analysis. Where appropriate the Range Safety Office uses the SAFE-RANGE program for computing safety footprints on standard weapons delivered from standard platforms under standard release conditions. The Chief, Range Safety is the approval authority for all weapons delivered on the PIRA. This approval is embedded as an integral part of the safety review process (AFFTC 2004). Subsequently, the probability of an environmental effect occurring that would impact safety if Alternative A were implemented would be less than significant; no mitigation would be required.

4.12.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

The safety related effects of armed munitions testing under Alternative B would be similar to those described under Alternative A. However, there would be fewer opportunities for impacts to occur because there would be fewer weapons delivery events per calendar year.

4.12.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

The safety related effects of armed munitions testing under Alternative C would be similar to those described under Alternative A. However, there would be fewer opportunities for impacts to occur because there would be fewer weapons delivery events per calendar year.

4.12.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no safety related impacts on the area near PB-13 or on the PIRA from the proposed armed munitions testing because this type of testing would not occur at Edwards AFB.

4.12.5 Mitigation Measures

Since no significant impacts to Safety would be anticipated under Alternative A, B, or C, no mitigation is required.

4.13 SOCIOECONOMICS

Socioeconomic impacts would be considered significant if they substantially altered the location and distribution of the population within the ROI, caused the population to exceed historic growth rates, decreased jobs so as to substantially raise the regional unemployment rates or reduce income generation, substantially affected the local housing market and vacancy rates, or resulted in the need for new social services and support facilities.

4.13.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

Since no new development would be required under Alternative A and current Air Force and contractor personnel from Edwards AFB would be used for the program, Alternative A would not impact the socioeconomics of on-base populations.

4.13.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

Since no new development would be required under Alternative B and current Air Force and contractor personnel from Edwards AFB would be used for the program, Alternative B would not impact the socioeconomics of on-base populations.

4.13.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

Since no new development would be required under Alternative C and current Air Force and contractor personnel from Edwards AFB would be used for the program, Alternative C would not impact the socioeconomics of on-base populations.

4.13.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, the armed munitions program would not be established at Edwards AFB for PB-13. Therefore, no socioeconomic impacts would occur to populations located on-base.

4.13.5 Mitigation Measures

Since no significant impacts to socioeconomics would be anticipated under Alternative A, B, or C, no mitigation is required.

4.14 WATER RESOURCES

A project would have a significant impact on water resources if it caused substantial flooding or erosion; substantially affected any significant water body, such as an ocean, stream, lake, or bay; exposed people to reasonably foreseeable hydrologic hazards such as flooding or tsunamis; or substantially affected surface or groundwater quality or quantity.

4.14.1 Alternative A— Desired Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year (Proposed Action)

The Proposed Action would designate PB-13 as an Armed Munitions Only target with a capacity of 100 weapons delivery events per year. No construction activities or relocation of existing PIRA facilities would be required. Armed munitions T&E would be conducted using air-to-ground and ground-to-ground missions. No off-road use of vehicles would occur while conducting ground-to-ground T&E of armed munitions.

There would be no adverse, significant impacts on water resources on or near PB-13 from the proposed testing. There are no perennial streams on Edwards AFB and storm water for the entire watershed is directed toward the three large playa lakebeds. Target PB-13 is not located in a flood-prone area nor is it located adjacent to surface water resources such as wetlands, springs, seeps, or riparian areas. Since the proposed testing activities would not take place in proximity to surface water resources, the proposed testing of armed munitions on the existing target would not affect surface water quality or supply. Therefore, impacts to these resources would be less than significant.

The proposed testing would have no effect on groundwater supply, as the testing of armed munitions does not require the consumption of water. The following three factors help decrease the potential for the by-products of armed munitions testing to affect groundwater sources (Naval Air Weapons Station and Bureau of Land Management 2002):

- Cleanup of residue in target impact areas;
- A limited physical mechanism to deliver residual materials to water bearing strata; and
- The rapid degradation of chemical residues in arid environments.

The target would be cleared of any duds after each mission and before any additional weapons were dropped on the target. Fragments and debris would be cleaned up on a routine basis per the range maintenance policy and AFI 13-212.

Detonation of a bomb results in fragmentation and dissemination of the casing as shrapnel. Over time, the fragments corrode and create oxides. Detonation of missiles results in slightly more debris but no changes in chemicals that could potentially enter the environment. The products of missile use are debris, metal

fragments, carbon dioxide, CO, and NO_x. The combustion of rocket fuel produces the same products (carbon dioxide, CO, and NO_x) that are produced by the combustion of explosive material. The combustion of the explosives results in chemical and air emissions as identified in Section 4.1. The potential also exists that the explosive material would not undergo complete combustion (due to malfunction) and would reach the environment as the unaltered explosive material.

The use of explosives in ordnance and other devices will release only minimal amounts of the original, unaltered explosive into the environment if the munitions function properly, resulting in complete combustion (Becker 1995). However, if the explosive is not fully combusted due to a malfunction (e.g., duds) then explosives can reach the environment.

The transport of ordnance residue to groundwater strata is dependent on a number of factors, including the physical and chemical properties of the residue, local climate (e.g., amount of precipitation), soil characteristics, and depth to groundwater. The climate at Edwards AFB is arid (high temperatures and low precipitation) and the distance to groundwater is estimated to be 191 to 210 feet below ground surface (bgs) based on the EMR groundwater monitoring wells closest to PB-13. Static groundwater measured at wells located approximately 1.1 miles north-northwest of PB-13 occurred at 191 feet bgs at groundwater monitoring well 442/2-MW01 and at 209 feet bgs at well 442/1-MW01 in March 2003 (Edwards AFB 2003b). At approximately 1.7 miles west of PB-13, static groundwater occurred at 210 feet bgs in May 2002.

Studies conducted by the U.S. Army at the Yuma Proving Grounds in Arizona concentrated on the migration of ordnance residue from high explosive impact areas. The study concluded that ordnance residue is not accumulating in soil or groundwater in the target vicinity and that the residue did not appear to be migrating through surface wash areas. The climatic conditions at Edwards AFB are similar to those at the Yuma ranges.

Target PB-13 is not located in an area where groundwater recharge occurs. Currently, there are no available data describing the ground water quality at PB-13, however analytical data on water quality obtained from monitoring wells up slope of the target site do not indicate that contamination from the use of explosives has affected the groundwater. The proposed weapons testing would be a continuation of past ground-disturbing activity that is expected to have a negligible effect on future groundwater quality. Therefore, the proposed testing of armed munitions would have no direct effect on groundwater provided that target maintenance is conducted as proposed.

4.14.2 Alternative B—Limited Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 50 Weapons Delivery Events per Calendar Year

The effects of armed munitions testing on surface water and groundwater under Alternative B would be similar to those described under Alternative A. However, the potential impacts would be less due to the fewer number of weapons delivery events per calendar year.

4.14.3 Alternative C—Minimum Capability—Designate PB-13 as an Armed Munitions Only Target with a Capacity of 10 Weapons Delivery Events per Calendar Year

The effects of armed munitions testing on surface water and groundwater under Alternative C would be similar to those described under Alternative A. However, the potential impacts would be less due to the fewer number of weapons delivery events per calendar year.

4.14.4 Alternative D (No-Action Alternative)

Under the No-Action Alternative, no armed munitions would be used on the PB-13 target. Mission aircraft would comply with approved flight profiles and inert weapons delivery procedures per applicable DoD, Air Force, and AFFTC instructions. There would be no impacts on soils or geology on or near the PB-13 target resulting from the No-Action Alternative.

4.14.5 Mitigation Measures

Specific mitigation for the Proposed Action will include clearing the target of any duds after each mission, and before any additional weapons are dropped on the target. Fragments and debris will be cleared from the target area prior to backfilling the crater.

4.15 CUMULATIVE IMPACTS

The CEQ Regulations define “cumulative impact” as the impact on the environment from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The ROI for cumulative impacts analysis includes Edwards AFB, PB-13 target area, and West Range of the PIRA. The areas with potential cumulative impacts include air quality, land use, and noise.

4.15.1 Past, Present, and Future Operations

Since the year 2000 the level of flight activity at AFFTC and Edwards AFB has remained fairly constant. Typically, when a flight test program is completed a new flight test program begins. The number of personnel, vehicles, aircraft, and basic infrastructure needed to support these flight activities is proportionate to the number of sorties flown. The number of sorties associated with operations at Edwards AFB (including NASA-related flights) from 2000 through 2003 have been approximately 10,500 per year (AFFTC 2004). The number of sorties has varied from a 7.5 percent reduction from year 2000 to 2001 to a 2.7 percent increase from year 2002 to 2003. Table 4-7 shows the breakdown by aircraft type and sorties for those years. These aircraft regularly use the runways, R-2515 restricted area, low-levels routes, supersonic corridors, and targets on the PIRA to test aircraft integration and system capabilities. Overall, flight test operations at Edwards AFB have been analyzed in the *EA for the Continued Use of Restricted Area R-2515* (AFFTC 1998c). The proposed action in the *EA for the Continued Use of Restricted Area R-2515* included the operations summarized in Table 4-9 and concluded that these operations resulted in no significant cumulative impacts.

Considering the 100 missions as an increment to existing operations is probably the worst case assumption, the evaluations completed for the overall flight test activity at Edwards AFB cited above were done with consideration for the normal and continuous initiation and completion of flight test programs. The armed munitions delivery missions as addressed in this EA in all probability would not be additive to actions already analyzed, but rather would replace flight test programs recently completed. However, given the extensive flight operations at Edwards AFB, the addition of 100 missions per year for two aircraft each is an increase of less than 2 percent. In general, since the operations (airspeeds, altitudes, aircraft type) of these 100 missions would be similar to those already evaluated, it would be expected these mission would have no measurable cumulative impact on most of the existing environment.

Table 4-9

Sortie Summary by Aircraft and Year at AFFTC

Aircraft Type	Year				Notes
	2000	2001	2002	2003	
B-1	110	118	135	81	
B-2	15	44	9	47	
B-52	47	69	61	70	
BE-20	0	3	53	28	NASA

Table 4-9, Page 1 of 2

Table 4-9 (Continued)

Sortie Summary by Aircraft and Year at AFFTC

Aircraft Type	Year				Notes
	2000	2001	2002	2003	
BE-200	50	66	75	49	NASA
Boeing	14	12	14	46	NASA/Contractor
C-5	0	0	3	34	
C-12	451	483	494	600	
C-130	106	163	92	84	
C/KC-135	674	653	784	837	
C-141	10	0	0	0	
C-17	194	139	223	194	
CH-46	275	266	326	346	USMC
CH-53	133	227	319	220	USMC
DC-8	12	19	44	34	NASA
ER-2	74	95	78	34	NASA
F-117	391	312	337	274	
F-15	1,088	920	843	820	
F-16	3,128	2,706	2782	3,035	
F-18	624	479	463	349	NASA
F-22	154	337	565	909	
KC-10	24	55	65	67	
T/AT-38	2,773	2,315	1,926	1,894	
T-39[1]	289	318	212	171	
Other	616	608	547	472	
Totals	11,252	10,407	10,450	10,695	

Table 4-9, Page 2 of 2
Note: 1 – The T-39 is no longer in the AFFTC inventory.
Source: AFFTC 2004

Current programs recently evaluated and shown to have no significant impact include:

- *Environmental Impact Statement for the Program Definition and Risk Reduction Phase of the Airborne Laser Program;*
- *Environmental Assessment for the Orbital Reentry Corridor for the Generic Unmanned Lifting Entry Vehicles Landing at Edwards Air Force Base; and*
- *Environmental Assessment for Hypersonic Corridors.*

Collectively the sorties for these three programs (Airborne Laser, Lifting Entry Vehicle, and Hypersonic Corridors) and this Armed Munitions Integration Testing on the PIRA program, could add up to 299 sorties annually (Table 4-10), less than a 2 percent increase in activity, which is well within the support

capacity of Edwards AFB and the AFFTC. The total sorties for the chase and support aircraft are expected to be routine flights that are included as part of the normal operational commitment, and therefore would not create any additional cumulative impacts.

Table 4-10

Projected Sorties for New Programs

	New Programs (Project Sorties)			
Year	Airborne Laser	Lifting Entry Vehicles	Hypersonic Corridors	Armed Munitions Integration Testing
2005	67	2	0	200
2006	72	2	0	200
2007	72	5	0	200
2008	69	5	24	200

Sources: AFFTC 2002; Wilson 2004

These projects are all flight-related and have been identified individually as resulting in no significant impacts to the environment. Like this EA, each of these programs deal with airspace, noise, and land use concerns that also result in minimal individual impacts. Detailed information and analysis of these projects is available on the Worldwide Web at http//:www.ealev.com, www.edwards-hypersoniccorridors-ea.com, and http://www.boeing.com/defense-space/military/abl/flash.html.

Another future program being evaluated is the next phase of the F-35 flight test program. Cumulative impacts of this program will be addressed in a separate EA.

4.15.2 Areas with Potential Cumulative Impacts

This section addresses the potential additive effects of implementing the Proposed Action (Designate PB-13 as an Armed Munitions Only Target with a Capacity of 100 Weapons Delivery Events per Calendar Year) in combination with projects identified in Section 14.5. No significant impacts have been identified for the Proposed Action or the other alternatives presented in this EA. The effects of using PB-13 as an armed munitions only target would result in cumulative impacts in the following areas.

4.15.2.1 Air Quality

The projects identified in Section 14.5 would be implemented during the same time frame as this action. They are not expected to have any significant cumulative air quality impacts. Air quality impacts from these projects do not individually result in any significant long-term impacts although they may result in localized impacts of short duration. Since these projects are primarily aircraft related, the air quality

impacts would occur as a result of aircraft launch and recovery operations and while the aircraft are operating below 3,000 feet AGL. Other air quality impacts would result from permitted OB/OD events that detonate 50 to 150 pounds of explosives each month. Due to the nature of the detonation process the chemicals in these emissions are consumed as part of the process. However, these actions when combined are still below the *de minimis* thresholds for criteria pollutants.

4.15.2.2 Natural Resources

The cumulative effects of the wind blown soils and contaminates on plants in the target area would be considered less than significant. The immediate target area is devoid of plants, and the area outside the immediate target area is sparsely populated with plants. Plant species in this area are typical for the PIRA as well as the other parts of the Mojave Desert area. Naval Air Station China Lake (located in the Mojave Desert area) routinely uses its' target sites for detonation of NEW armed munitions. There are no records of direct impacts to plants or sensitive species resulting from the use of their targets and test sites. Because natural resources are similar and there are a large number of these plants scattered throughout the ranges combined with the lack of any identified impacts, the use of the target site would have a less than significant impact on the plant species surrounding the target area.

4.15.2.3 Geology and Soils

The designation and use of the PB-13 target for armed munitions only integration testing would not result in a significant cumulative change in the geology and soils of the target area. The target area is graded soil classified as typically sandy loam and gravel. The gravel would undergo shattering/pulverizing and would generate fine sand and PM10 (approximately 11.36 tons per year based on 100 – 500 NEW detonations) as a result of the detonations. The soils at Edwards AFB are given an erosion hazard of slight to severe for wind erosion. Since the target site would be backfilled after each mission, the fines and silt would be mixed with the sandy loam and gravel, thus minimizing the potential effects of wind erosion on an open crater.

4.15.2.4 Land Use

The ROI for this Proposed Action is within the base boundary of Edwards AFB; therefore, only cumulative effects occurring on Edwards AFB will be addressed. The PB-13 target area is on a designated Air Force range and is designated for primary use as a bombing and laser target. Past military test and evaluation activities do not present any further or additional environmental impacts when combined with this Proposed Action. Weapons delivery activities have routinely occurred on this target

in the past, as well as other targets on the West Range, East Range, and PB-6 target area. Range management activities include routine inspection and cleanup of all range target sites. The cleanup of the PB-13 target site after each event would prove to be beneficial because this action would further minimize the opportunity for any environmental impacts. Minor cumulative impacts on the land use would result from restricting use of PB-13 to Armed Munitions Only; bombs with spotting charges and inert rounds would have to use other designed targets. Because there are at least eight other bombing targets on the PIRA there would be no significant impact.

4.15.2.5 Noise

Several sources of noise were evaluated to determine if, when considered comprehensively, they would result in cumulative noise impacts. These include aircraft, transportation, construction, and detonation-related noise. The noise impacts of the detonations and sonic booms can result in a similar response. Both are measured in pound per square foot and are impulsive. As such, these impacts are considered together.

The aircraft that generate sonic booms which impact the ROI operate in the High Altitude Supersonic Corridor, which lies directly above Edwards AFB. These aircraft are primarily the T-38, F-15, F-16, F-18, and F-22; they are flown at altitudes above 30,000 feet above MSL and speeds that range from Mach 1.0 to 2.0 [678 to 1,356 mph]. These flights generate sonic booms with intensities up to approximately 2.5 psf which is of the same general intensity as the loudest expected from an armed munitions detonation. In the *EA to Extend the Supersonic Speed Waiver for Continued Operations in the Black Mountain Supersonic Corridor and Alpha Corridor/Precision Impact Range* (AFFTC 2001) it was estimated that over 600 supersonic flights were conducted through this area annually. From 1997 through April of 2001, only 56 noise complaints were received from persons within 50 miles of the corridors. Use of the local supersonic corridor by these aircraft does create additional noise impacts; however analysis has shown these noise levels do not create a significant adverse impact (AFFTC 2002). The addition of up to 100 events resulting from detonations would also create additional noise impacts; however based on past experience this would not create a significant adverse impact.

The noise created from other off-base transportation sources is expected to increase as a result of an increase in area population. The programs (Airborne Laser, Lifting Entry Vehicle, Armed Munitions Integration and Testing) would use existing vehicles and equipment. Noise created from these sources would not add to the current noise levels. Because construction activities are not anticipated in support of

these new programs, additional construction-related noise would not have a cumulative environmental impact.

The addition of noise generated from up to 100 armed munition detonations per year resulting from weapons delivery testing of bombs, rockets, or mortars would increase the noise in the region of interest; however, this additional increase would add to the noise in the ROI only for very brief periods of time and would be less than significant. Figure 4-2 shows the noise contours for the 500-pound NEW detonation at PB-13 target. At the base boundary (1.7 miles from the target) the DNL (Ldn [A]) value is 24 dBA. A dBA value less than 65 dBA is within the accepted guidelines (FICUN 1980). The U.S. Army found that notifying the public in the surrounding areas when the detonations were planned could minimize the number of complaints. It must be noted, however, that the PB-13 target area is in an extremely remote area and the closest off-base inhabitants (in Hi Vista, California) are approximately 9 miles from the target. At this distance the noise values that would result from these flights are lower than ambient noise created from other civilian noise sources. Therefore, less than significant cumulative noise impacts are anticipated under the Armed Munitions Integration Testing on the PIRA Program.

4.16 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts include those impacts that are negative, occurring regardless of any identified minimization measures.

4.16.1 Ecological Resources

The proposed action would likely prevent the re-growth of small areas of terrestrial plant communities and reintroduction of any wildlife habitat to the PB-13 target site. The land routinely graded for this project was previously disturbed, so the plant communities are of marginal quality for wildlife.

4.16.2 Land Use

Under the proposed action, land use for the PB-13 target would only be used for armed munitions testing missions. This target site would not be available for other uses including inert munitions testing missions.

4.16.3 Safety

A crash of the weapons delivery aircraft or an off-target impact of an armed munition would result in unavoidable adverse impacts. However, because test procedures and safety criteria will be strictly

adhered to there is a low probability of a crash. The whole purpose of this program is to aid in the development of weapons and weapon systems with improved accuracy that work on a variety of platforms. Accuracy of the Air Force weapons over the years has improved dramatically. For example the Eighth Air Force in 1944 only 7 percent of all bombs hit within 1,000 feet of their aim point. The circular error of probability for World War II was 3,300 feet, 1,000 feet in Korea, and 400 feet in Vietnam. By the Gulf War the "smart airplane" dropping dumb bombs from low altitude could place an unguided munition within 30 feet of a target. Hellfire missiles fired by an Apache helicopter reported 102 direct hits out of 107 missiles expended (a hit rate of better than 95 percent). By following the strict test procedures establishing PB-13 as an Armed Munitions Only target would not result in any significant unavoidable adverse impacts.

4.17 SHORT-TERM VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

Examples of short-term uses of the environment include direct, construction-related disturbances and direct impacts associated with an increase in population and activity that occurs over a period typically less than 5 years. Long-term uses of the environment include impacts occurring over a period of more than 5 years, including permanent resource loss.

Since no new development would be required under the Armed Munitions Integration Testing on the PIRA Program and current Air Force or contractor personnel from other bases would be used for the program, neither Alternative A, B, nor C would involve any short- or long-term changes in population or productivity of the environment.

4.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable resource commitments are related to the use of nonrenewable natural resources and the effects that the use of those resources will have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of implementing an action (e.g., extinction of a rare or threatened species, or the disturbance of an important cultural resource site). In accordance with NEPA (40 CFR 1502.16), this section includes a discussion of any irreversible and irretrievable commitment of resources associated with the proposed project.

This programmatic EA only addresses the launch and delivery of weapons that would impact and detonate on the PIRA PB-13 target area. Implementing any of these proposed actions would not require an irreversible or irretrievable commitment of resources. Irreversible or irretrievable commitment of resources that would be involved in other phases of the program (e.g., weapon fabrication, transportation to Edwards AFB, flights with specific payloads) would be addressed in separate environmental documentation. Implementation of Alternative D (No-Action Alternative) would also not require an irreversible or irretrievable commitment of resources.

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8.0 ACRONYMS AND ABBREVIATIONS

412 OG	412th Operations Group
412 TW	412th Test Wing
412 TW/ENROR	Range Safety Office
AFB	Air Force Base
AFFTC	U.S. Air Force Flight Test Center
AFI	Air Force Instruction
AFMC	Air Force Mobility Command
AFOSH	Air Force Occupational Safety and Health
AFRL	Air Force Research Lab
AGE	aerospace ground equipment
AGL	above ground level
AICUZ	air installation compatible use zone
AL	A-weighted sound level
AOC	area of concern
APZ	accident potential zone
ARTCC	Air Route Traffic Control Center
ATC	air traffic control
AVEK	Antelope Valley East Kern
BCP	Base Comprehensive Plan
bgs	below ground surface
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal/EPA	California Environmental Protection Agency
CARB	California Air Resources Board
CATEX	categorical exclusion
CCF	Central Coordinating Facility
CCR	California Code of Regulations
CDNL	C-weighted day-night level
CEQ	Council on Environmental Quality

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFA	controlled firing area
CFR	Code of Federal Regulations
CHABA	Committee on Hearing, Bioacoustics and Biomechanics
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CSEL	C-weighted sound exposure level
dB	decibels
dBA	A-weighted decibels
dBC	C-weighted decibels
dBP	peak sound level
DFRC	Dryden Flight Research Center
DNL	day-night average noise level
DoD	Department of Defense
DWMA	Desert Wildlife Management Area
EA	Environmental Assessment
EFTR	Edwards Flight Test Range
EMR	electromagnetic radiation
EO	Executive Order
EOD	explosive ordnance disposal
ESA	Endangered Species Act
^{O}F	degrees Fahrenheit
FAA	Federal Aviation Administration
FICUN	Federal Interagency Committee on Urban Noise
FL	flight level
FONSI	Finding of No Significant Impact
GP	general purpose
GSE	ground support equipment

% HA	percentage of exposed persons who are highly annoyed
HMX	High Melt Explosive
HUD	U.S. Department of Housing and Urban Development
Hz	hertz
IFR	instrument flight rules
IR	Instrument Route
IRP	Installation Restoration Program
JPL	Jet Propulsion Laboratory
KCAPCD	Kern County Air Pollution Control District
L_{dn}	day/night average noise level
L_{eq}	long-term equivalent A-weighted sound level
LTO	landing and takeoff
MARSA	military assumes responsibility for separation of aircraft
MDAB	Mojave Desert Air Basin
$\mu g/m^3$	micrograms per cubic meter
MOA	Military Operation Area
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NACO	National Aeronautical Charting Office
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NAVD	North American Vertical Datum
NCA	Noise Control Act
NEPA	National Environmental Policy Act
NEW	net explosive weight
NM	nautical miles
NO_2	nitrogen dioxide

1	NRHP	National Register of Historic Places
2	OB/OD	openburn/open detonation
3	OU	Operable Unit
4	PB	precision bombing
5	PETN	pentaerythritol tetranitrate
6	PIRA	Precision Impact Range Area
7	PL	Public Law
8	PM_{10}	particulate matter 10 microns or less in diameter
9	$PM_{2.5}$	particulate matter 2.5 microns or less in diameter
10	ppm	parts per million
11	PSD	Prevention of Significant Deterioration
12	psf	pounds per square foot
13	psi	pounds per square inch
14	RCRA	Resource Conservation and Recovery Act
15	RDX	cyclotrimethylenetrinitramine
16	RMCC	Ridley Mission Control Center
17	ROI	Region of Influence
18	SEA	Significant Ecological Area
19	SEL	sound exposure level
20	SIP	State Implementation Plan
21	SO_2	sulfur dioxide
22	SPL	sound pressure level
23	SUA	special use airspace
24	T&E	test and evaluation
25	TNT	trinitrotoluene
26	TRACON	terminal radar approach
27	UAV	unmanned aerial vehicle
28	USACE	U.S. Army Corps of Engineers

USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
U.S. EPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UXO	unexploded ordnance
VFR	visual flight rules
VOC	volatile organic compound
VR	Visual Route

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A AIR QUALITY ANALYSIS

B-52 G-H Aircraft Activity and Emissions for Edwards AFB

Aircraft Type	Engine Type	Number of Engines	Operation Cycle	Mode of Operation	Fuel Flow (lb/min)	Emission Factors (lb/1,000 lb of fuel)				
						ROGs	NOx	CO	SOx	PM
B-52G/H	TF33-3	8	LTO	Take Off	124.00	0.60	10.00	1.70	1.00	1.73
				Climb Out	104.00	0.70	8.50	2.30	1.00	1.88
				Approach	63.33	2.60	5.80	6.30	1.00	0.99
				Idle (Taxi-in)	15.00	84.00	1.80	107.00	1.00	0.23
				Idle (Taxi-out)	15.00	84.00	1.80	107.00	1.00	0.23
			TGO	Take Off	124.00	0.60	10.00	1.70	1.00	1.73
				Climb Out	104.00	0.70	8.50	2.30	1.00	1.88
				Approach	63.30	2.60	5.80	6.30	1.00	0.99

Number of Operations	Operation Cycle	Time in Mode (minutes)	Emissions (tpy)				
			ROGs	NOx	CO	SOx	PM
100	LTO	1.00	0.03	0.50	0.08	0.05	0.09
		2.00	0.06	0.71	0.19	0.08	0.16
		6.00	0.40	0.88	0.96	0.15	0.15
		15.00	7.56	0.16	9.63	0.09	0.02
		30.00	15.12	0.32	19.26	0.18	0.04
	TGO	1.00	-	-	-	-	-
		1.50	-	-	-	-	-
		7.50	-	-	-	-	-
Emissions (tpy)			***23.16***	***2.57***	***30.12***	***0.55***	***0.45***

F-16 Aircraft Activity and Emissions for Edwards AFB

Aircraft Type	Engine Type	Number of Engines	Operation Cycle	Mode of Operation	Fuel Flow (lb/min)	Emission Factors (lb/1,000 lb of fuel)				
						ROGs	NOx	CO	SOx	PM
F-16	F100-220	1	LTO	Take Off (Mil)	176.33	0.10	27.00	0.90	1.00	0.34
				Climb Out	85.17	0.10	9.80	1.60	1.00	0.47
				Approach	50.00	1.90	6.70	5.80	1.00	0.27
				Idle (Taxi-in)	17.33	3.20	3.30	24.00	1.00	0.12
				Idle (Taxi-out)	17.33	3.20	3.30	24.00	1.00	0.12
				Afterburner	862.17	0.01	3.10	4.00	1.00	0.15
			TGO	Take Off	176.33	0.10	27.00	0.90	1.00	0.34
				Climb Out	85.17	0.10	9.80	1.60	1.00	0.47
				Approach	50.00	1.90	6.70	5.80	1.00	0.27

Number of Operations	Operation Cycle	Time in Mode (minutes)	Emissions (tpy)				
			ROGs	NOx	CO	SOx	PM
100	LTO	1.00	0.00	0.24	0.01	0.01	0.00
		1.00	0.00	0.04	0.01	0.00	0.00
		5.00	0.02	0.08	0.07	0.01	0.00
		15.00	0.04	0.04	0.31	0.01	0.00
		25.00	0.07	0.07	0.52	0.02	0.00
		-	-	-	-	-	-
0	TGO	1.00	-	-	-	-	-
		0.50	-	-	-	-	-
		4.00	-	-	-	-	-
	Emissions (tpy)		***0.14***	***0.48***	***0.92***	***0.06***	***0.01***

F-15 Aircraft Activity and Emissions for Edwards AFB

Aircraft Type	Engine Type	Number of Engines	Operation Cycle	Mode of Operation	Fuel Flow (lb/min)	Emission Factors (lb/1,000 lb of fuel)				
						ROGs	NOx	CO	SOx	PM
F-15	F100-220	2	LTO	Take Off (Mil)	176.33	0.10	27.00	0.90	1.00	0.34
				Climb Out	85.17	0.10	9.80	1.60	1.00	0.47
				Approach	50.00	1.90	6.70	5.80	1.00	0.27
				Idle (Taxi-in)	17.33	3.20	3.30	24.00	1.00	0.12
				Idle (Taxi-out)	17.33	3.20	3.30	24.00	1.00	0.12
				Afterburner	862.17	0.01	3.10	4.00	1.00	0.15
			TGO	Take Off	176.33	0.10	27.00	0.90	1.00	0.34
				Climb Out	85.17	0.10	9.80	1.60	1.00	0.47
				Approach	50.00	1.90	6.70	5.80	1.00	0.27

Number of Operations	Operation Cycle	Time in Mode (minutes)	Emissions (tpy)				
			ROGs	NOx	CO	SOx	PM
100	LTO	1.00	0.00	0.48	0.02	0.02	0.01
		1.00	0.00	0.08	0.01	0.01	0.00
		5.00	0.05	0.17	0.15	0.03	0.01
		15.00	0.08	0.09	0.62	0.03	0.00
		25.00	0.14	0.14	1.04	0.04	0.01
		-	-	-	-	-	-
0	TGO	1.00	-	-	-	-	-
		1.50	-	-	-	-	-
		7.50	-	-	-	-	-
	Emissions (tpy)		***0.27***	***0.96***	***1.84***	***0.12***	***0.03***

T-38 Aircraft Activity and Emissions for Edwards AFB

Aircraft Type	Engine Type	Number of Engines	Operation Cycle	Mode of Operation	Fuel Flow (lb/min)	Emission Factors (lb/1,000 lb of fuel)				
						ROGs	NOx	CO	SOx	PM
T-38	J85-5A	2	LTO	Take Off	43.83	0.80	2.60	29.00	1.00	0.01
				Climb Out	24.33	3.50	2.30	43.00	1.00	0.01
				Approach	16.67	6.40	1.80	73.60	1.00	0.01
				Idle (Taxi-in)	7.50	30.00	1.30	178.00	1.00	-
				Idle (Taxi-out)	7.50	30.00	1.30	178.00	1.00	-
			TGO	Take Off	43.83	0.80	2.60	29.00	1.00	0.01
				Climb Out	24.33	3.50	2.30	43.00	1.00	0.01
				Approach	16.67	6.40	1.80	73.60	1.00	0.01

Number of Operations	Operation Cycle	Time in Mode (minutes)	Emissions (tpy)				
			ROGs	NOx	CO	SOx	PM
100	LTO	1.00	0.00	0.01	0.13	0.00	0.00
		1.00	0.01	0.01	0.10	0.00	0.00
		5.00	0.05	0.02	0.61	0.01	0.00
		10.00	0.23	0.01	1.34	0.01	-
		15.00	0.34	0.01	2.00	0.01	-
0	TGO	1.00	-	-	-	-	-
		0.50	-	-	-	-	-
		4.00	-	-	-	-	-
	Emissions (tpy)		***0.63***	***0.06***	***4.18***	***0.03***	***0.00***

Total Expected Aircraft Emissions

		Emissions (tons/yr)				
		VOC	**NO_2**	**CO**	**SO_2**	**PM_{10}**
Alternative A						
Mission Aircraft	Flights					
B-52 G-H	10	2.32E+00	2.57E-01	3.01E+00	5.55E-02	4.55E-02
F-16	68	9.25E-02	3.25E-01	6.25E-01	4.10E-02	8.52E-03
F-15	22	5.98E-02	2.10E-01	4.04E-01	2.65E-02	5.51E-03
total		*2.469*	*0.792*	*4.042*	*0.123*	*0.060*
Chase Aircraft						
F-16	70	9.52E-02	3.35E-01	6.43E-01	4.22E-02	8.77E-03
T-38	30	1.88E-01	1.69E-02	1.25E+00	1.02E-02	4.55E-05
total		*0.284*	*0.351*	*1.898*	*0.052*	*0.009*
Total		***2.752***	***1.144***	***5.940***	***0.175***	***0.068***
Alternative B						
Mission Aircraft	Flights					
B-52 G-H	5	1.16E+00	1.29E-01	1.51E+00	2.77E-02	2.27E-02
F-16	34	4.62E-02	1.62E-01	3.12E-01	2.05E-02	4.26E-03
F-15	11	2.99E-02	1.05E-01	2.02E-01	1.33E-02	2.76E-03
total		*1.234*	*0.396*	*2.021*	*0.061*	*0.030*
Chase Aircraft						
F-16	35	4.76E-02	1.67E-01	3.22E-01	2.11E-02	4.39E-03
T-38	15	9.42E-02	8.46E-03	6.27E-01	5.09E-03	2.27E-05
total		*0.142*	*0.176*	*0.949*	*0.026*	*0.004*
Total		***1.376***	***0.572***	***2.970***	***0.088***	***0.034***
Alternative C						
Mission Aircraft	Flights					
B-52 G-H	1	2.32E-01	2.57E-02	3.01E-01	5.55E-03	4.55E-03
F-16	7	9.52E-03	3.35E-02	6.43E-02	4.22E-03	8.77E-04
F-15	2	5.44E-03	1.91E-02	3.68E-02	2.41E-03	5.01E-04
total		*0.247*	*0.078*	*0.402*	*0.012*	*0.006*
Chase Aircraft						
F-16	7	9.52E-03	3.35E-02	6.43E-02	4.22E-03	8.77E-04
T-38	3	1.88E-02	1.69E-03	1.25E-01	1.02E-03	4.55E-06
total		*0.028*	*0.035*	*0.190*	*0.005*	*0.001*
Total		***0.275***	***0.113***	***0.592***	***0.017***	***0.007***

Related Mobile Source Emissions (on ground)

Alternative A

Equipment or Vehicle Type	Rate of Emissions	Number of Equipment or Vehicles	HP	Vehicle Miles Traveled		Number of Missions	Hours per Day	Emission Type	NO_2 Emission Factor[1]	Total NO_2 Emissions (tons/yr)	SO_2 Emission Factor[1]	Total SO_2 Emissions (tons/yr)	CO Emission Factor[1]	Total CO Emissions (tons/yr)	VOC Emission Factor[1]	Total VOC Emissions (tons/yr)	PM_{10} Emission Factor[1]	Total PM_{10} Emissions (tons/yr)	Entrained PM_{10} Emission Factor[2,3] (lbs/VMT)		Total Entrained PM_{10} Emissions (tons/yr)
				Paved	Unpaved														Paved	Unpaved	
LDGV, LDGT, &HDGT	g/VMT	3	N/A	40	10	100	N/A	Travel	0.90	1.49E-02	0.00	0.00E+00	8.87	1.47E-01	0.91	1.50E-02	0.11	1.82E-03	0.016	0.781	1.15E-01
	g/VMT							Cold Start	2.77	4.58E-02	0.00	0.00E+00	93.49	1.55E+00	5.21	8.61E-02	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Hot Start	1.76	2.91E-02	0.00	0.00E+00	12.74	2.11E-01	1.38	2.28E-02	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Hot Soak	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	2.11	3.49E-02	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Diurnal	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	5.01	8.28E-02	0.00	0.00E+00	N/A	N/A	N/A
LDDT	g/VMT	1	N/A	40	10	100	N/A	Travel	12.01	6.62E-02	0.00	0.00E+00	11.03	6.08E-02	2.78	1.53E-02	2.63	1.45E-02	0.016	0.781	3.91E-01
	g/VMT							Cold Start	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Hot Soak	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Diurnal	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	N/A	N/A	N/A
Backhoe Loader	lb/hour	1	N/A	N/A	10	100	2	N/A	1.89	1.89E-01	0.18	1.80E-02	0.57	5.70E-02	0.29	2.90E-02	0.17	1.70E-02	N/A	6.540	3.27E+00
				TOTAL Emissions in tons/year						***0.345***		***0.018***		***2.021***		***0.286***		***0.033***			***3.776***

Alternative B

Equipment or Vehicle Type	Rate of Emissions	Number of Equipment or Vehicles	HP	Vehicle Miles Traveled		Number of Missions	Hours per Day	Emission Type	NO_2 Emission Factor[1]	Total NO_2 Emissions (tons/yr)	SO_2 Emission Factor[1]	Total SO_2 Emissions (tons/yr)	CO Emission Factor[1]	Total CO Emissions (tons/yr)	VOC Emission Factor[1]	Total VOC Emissions (tons/yr)	PM_{10} Emission Factor[1]	Total PM_{10} Emissions (tons/yr)	Entrained PM_{10} Emission Factor[2,3] (lbs/VMT)		Total Entrained PM_{10} Emissions (tons/yr)
				Paved	Unpaved														Paved	Unpaved	
LDGV, LDGT, &HDGT	g/VMT	3	N/A	40	10	50	N/A	Travel	0.90	7.44E-03	0.00	0.00E+00	8.87	7.33E-02	0.91	7.52E-03	0.11	9.09E-04	0.016	0.781	5.74E-02
	g/VMT							Cold Start	2.77	2.29E-02	0.00	0.00E+00	93.49	7.73E-01	5.21	4.31E-02	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Hot Start	1.76	1.46E-02	0.00	0.00E+00	12.74	1.05E-01	1.38	1.14E-02	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Hot Soak	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	2.11	1.74E-02	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Diurnal	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	5.01	4.14E-02	0.00	0.00E+00	N/A	N/A	N/A
LDDT	g/VMT	1	N/A	40	10	50	N/A	Travel	12.01	3.31E-02	0.00	0.00E+00	11.03	3.04E-02	2.78	7.66E-03	2.63	7.25E-03	0.016	0.781	1.96E-01
	g/VMT							Cold Start	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Hot Soak	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Diurnal	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	N/A	N/A	N/A
Backhoe Loader	lb/hour	1	N/A	N/A	10	50	2	N/A	1.89	9.45E-02	0.18	9.00E-03	0.57	2.85E-02	0.29	1.45E-02	0.17	8.50E-03	N/A	6.540	1.64E+00
				TOTAL Emissions in tons/year						***0.172***		***0.009***		***1.010***		***0.143***		***0.017***			***1.888***

Alternative C

Equipment or Vehicle Type	Rate of Emissions	Number of Equipment or Vehicles	HP	Vehicle Miles Traveled		Number of Missions	Hours per Day	Emission Type	NO_2 Emission Factor[1]	Total NO_2 Emissions (tons/yr)	SO_2 Emission Factor[1]	Total SO_2 Emissions (tons/yr)	CO Emission Factor[1]	Total CO Emissions (tons/yr)	VOC Emission Factor[1]	Total VOC Emissions (tons/yr)	PM_{10} Emission Factor[1]	Total PM_{10} Emissions (tons/yr)	Entrained PM_{10} Emission Factor[2,3] (lbs/VMT)		Total Entrained PM_{10} Emissions (tons/yr)
				Paved	Unpaved														Paved	Unpaved	
LDGV, LDGT, &HDGT	g/VMT	3	N/A	40	10	10	N/A	Travel	0.90	1.49E-03	0.00	0.00E+00	8.87	1.47E-02	0.91	1.50E-03	0.11	1.82E-04	0.016	0.781	1.15E-02
	g/VMT							Cold Start	2.77	4.58E-03	0.00	0.00E+00	93.49	1.55E-01	5.21	8.61E-03	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Hot Start	1.76	2.91E-03	0.00	0.00E+00	12.74	2.11E-02	1.38	2.28E-03	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Hot Soak	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	2.11	3.49E-03	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Diurnal	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	5.01	8.28E-03	0.00	0.00E+00	N/A	N/A	N/A
LDDT	g/VMT	1	N/A	40	10	10	N/A	Travel	12.01	6.62E-03	0.00	0.00E+00	11.03	6.08E-03	2.78	1.53E-03	2.63	1.45E-03	0.016	0.781	3.94E-02
	g/VMT							Cold Start	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Hot Soak	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	N/A	N/A	N/A
	g/VMT							Diurnal	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	N/A	N/A	N/A
Backhoe Loader	lb/hour	1	N/A	N/A	10	10	2	N/A	1.89	1.89E-02	0.18	1.80E-03	0.57	5.70E-03	0.29	2.90E-03	0.17	1.70E-03	N/A	6.540	3.27E-01
				TOTAL Emissions in tons/year						***0.034***		***0.002***		***0.202***		***0.029***		***0.003***			***0.378***

Notes:

1 - Emission factors were obtained using EMFAC 7G

2 - Emission factors for the Backhoe Loader were obtained from SCAQMD CEQA Air Quality Handbook 1993, Table A9-9D with average mean vehicle weight of 13 to

3 - Emission factors for the LDGV, LDGT, HDGT, and LDDT were obtained from AP-42 Emission Facotrs, December 200

CO - carbon monoxide

LDDT - light-duty diesel truck

LDGV - light-duty gasoline vehicle

N/A - not applicable

NO_2 - nitrogen dioxide

PM_{10} - particulate matter equal to or below 10 microns

SO_2 - sulfur dioxide

VOC - volatile organic compounds

Related Stationary Source Emissions (on ground)

Alternative A

Process Description	Fuel Type	Power Rating (BTU/hr)	Operation (hrs/det)	Flights (per year)	NO_2 (lb/MMBtu)	NO_2 Emission Rate (tons/year)	CO (lb/MMBtu)	CO Emission Rate (ton/year)	SO_2 (lb/MMBtu)	SO_2 Emission Rate (ton/year)	PM_{10} (lb/MMBtu)	PM_{10} Emission Rate (ton/year)	VOC Emission Factor (lb/MMBtu)	VOC Emission Rate (ton/year)
A/M32A-60B (Generator)	JP-8	3,543,300	2	100	0.698	0.247	0.048	0.017	0.0505	0.018	0.061	0.022	0.017	0.006

Alternative B

Process Description	Fuel Type	Power Rating BTU/hr	Operation (hrs/flight)	Flights (per year)	NO_2 (lb/MMBtu)	NO_2 Emission Rate (tons/year)	CO (lb/MMBtu)	CO Emission Rate (ton/year)	SO_2 (lb/MMBtu)	SO_2 Emission Rate (ton/year)	PM 10 (lb/MMBtu)	PM_{10} Emission Rate (ton/year)	VOC Emission Factor (lb/MMBtu)	VOC Emission Rate (ton/year)
A/M32A-60B (Generator)	JP-8	3,543,300	2	50	0.698	0.124	0.048	0.009	0.0505	0.009	0.061	0.011	0.017	0.003

Alternative C

Process Description	Fuel Type	Power Rating BTU/hr	Operation (hrs/flight)	Flights (per year)	NO_2 (lb/MMBtu)	NO_2 Emission Rate (tons/year)	CO (lb/MMBtu)	CO Emission Rate (ton/year)	SO_2 (lb/MMBtu)	SO_2 Emission Rate (ton/year)	PM 10 (lb/MMBtu)	PM_{10} Emission Rate (ton/year)	VOC Emission Factor (lb/MMBtu)	VOC Emission Rate (ton/year)
A/M32A-60B (Generator)	JP-8	3,543,300	2	10	0.698	0.025	0.048	0.002	0.0505	0.002	0.061	0.002	0.017	0.001

Note: Emission Factors were obtained from the Enterprize Environmental, Safety, and Occupational Health, Comman Core System, APIMS Database, available at www.eesoh.com/site/do/ccs/overview, accessed in August 19, 2004.

Appendix A Air Emission Analysis for Environmental Assessment for Armed Munitions Integration Testing on the PIRA

Related Energetic Material Detonation Emissions

Speciation for Detonation of Comp B and C4

	Comp B_1		Comp $C4_1$	
Amount (lbs)	500		500	
Emissions	Emission Factor (lbs/lb)	Amount Released (lbs/detonation)	Emission Factor (lbs/lb)	Amount Released (lbs/detonation)
CO	3.72E-02	18.620	2.49E-02	12.464
CO_2	1.26E+00	631.510	1.26E+00	629.683
NO_2	2.95E-02	14.746	3.73E-02	18.660
PM_{10}	2.20E-01	110.026	2.20E-01	110.231
NMHC	1.30E-03	0.651	1.30E-03	0.650
C_4H_6	7.81E-06	0.004	7.84E-06	0.004
C_6H_{14}	4.55E-06	0.002	4.55E-06	0.002
CH_3Cl	2.52E-06	0.001	2.52E-06	0.001
C_6H_6	9.38E-05	0.047	9.37E-05	0.047
$C_6H_5CH_3$	3.48E-05	0.017	3.49E-05	0.017
CH_2=CHCl	5.79E-06	0.003	5.79E-06	0.003
Cl_2=CCl_2	9.57E-06	0.005	9.60E-06	0.005
CCl_4	2.03E-06	0.001	2.03E-06	0.001
CH_2Cl_2	2.63E-04	0.132	2.64E-04	0.132
TEQ_{DF}	1.80E-09	0.000	1.80E-09	0.000
$C_3H_6N_6O_6$ (RDX)	1.61E-03	0.804	1.61E-03	0.807
$C_7H_5N_3O_6$ (TNT)	1.76E-07	0.000	N/A	N/A

Speciation for Detonation of TNT

	TNT_2	
Amount (lbs)	500	
Emissions	Emission Factor (lbs/lb)	Amount Released (lbs/detonation)
CO	4.31E-01	215.745
N_2*	1.85E-01	92.450
H_2O	1.98E-01	99.000
$C_{(s)}$	1.85E-01	92.540

* - 1 mole N_2 = 2 moles NO_2

1 mole N_2 = 28.02 grams, 1 mole NO2 = 46.01 grams

1 lb = 453.59 grams

9.25E+01 lbs N_2 = 1496.588 mol N_2

1.50E+03 mol N_2 = 2993.176 mol NO_2

2.99E+03 mol NO_2 = 303.613 lbs NO_2

Emissions (lbs) per 500-lb Detonation

	PM_{10}	CO	NO_x	VOCs
Comp B[1]	110.830	18.620	14.746	0.863
Comp C4[1]	111.037	12.464	18.660	0.862
TNT[2]	92.540	215.745	303.613	N/A

Note: Uncombusted energetic material (TNT and RDX) were included in PM_{10} emissions.

Total Yearly Emissions per Alternative

		PM_{10}	CO	NO_2	VOCs
Comp B_1	Alternative A 100 det/year	5.542	0.931	0.737	0.043
	Alternative B 50 det/year	2.771	0.465	0.369	0.022
	Alternative C 10 det/year	0.554	0.093	0.074	0.004
Comp $C4_1$	Alternative A 100 det/year	5.552	0.623	0.933	0.043
	Alternative B 50 det/year	2.776	0.312	0.466	0.022
	Alternative C 10 det/year	0.555	0.062	0.093	0.004
TNT_2	Alternative A 100 det/year	4.627	10.787	15.181	N/A
	Alternative B 50 det/year	2.776	5.394	7.590	N/A
	Alternative C 10 det/year	0.463	1.079	1.518	N/A

Notes:

1 - Emission Factors were obtained from the Technical Memorandum, Air Emissions from Incidental Ordnance Detonation During a Prescribed Burn on Ranges 43 through 48, Former Fort Ord, California. Harding ESE Project No. 46310 00117. November 9, 2001.

2 - Emissions factors were deteremined based on a mass balance calculation for 100% cobmustion of TNT, see attached. It should be noted that all N_2 was assumed to be converted to NO_2 and was reported as such in the Total Emissions (1 mole N_2 = 2 moles NO_2). In addition, the carbon formed (soot) was considered particulate matter.

NMHC - Non-Methane Hydrocarbons

TEQ_{DF} - Dioxin/Furan Toxicity Equivalent

TEQ_{DF} - Dioxin/Furan Toxicity Equivalent

PM_{10} Emissions from Soil Displacement During Detonation

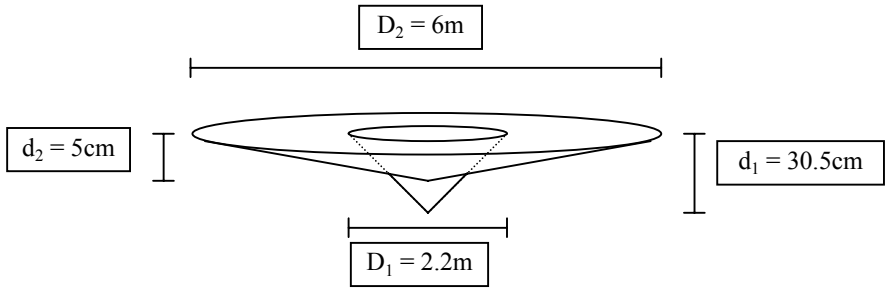
Based on information obtained from the *Small Mammal Burrow Entrance Collapse Study at the Open Burn Open Detonation Facility, Precision Impact Range Area, Edwards Air Force Base, California* , prepared by Linda Anton and Carolyn Ronning in 2000, detonation of a 500-pound explosive generates two distinct craters in the immediate area of impact. The first, and deepest, is 2.2 meters (m) in diameter and 30.5 centimeters (cm) deep. The second, and wider, is 6 m in diameter and only 5 cm deep. The first crater displaces an amount of soil that we will call volume 1 (V_1) and the second an amount we will call volume 2 (V_2). It should be noted that by simply adding these two volumes, a given volume ($V_{overlap}$) included in both craters would be counted twice. Therefore $V_{overlap}$, the volume of overlap by the two craters, should only be counted once and will therefore be subtracted from the volume of the second crater. The resulting equation for the total volume (V_{total}) then becomes:

$V_{total} = V_1 + (V_2 - V_{overlap})$

Where,

Vtotal	=	Total volume of soil displaced from the detonation of 500-pounds of energetic material.
V1	=	Volume of the inner, deeper crater generated from detonation of the explosive.
V2	=	Volume of the outer, wider crated generated from the detonation of the explosive.
Voverlap	=	Volume of overlap between the two craters.

It was assumed that the craters generated would be most closely mimicked by the shape of a cone. Therefore, the equation for calcutlating the volume of a cone was used to calculate the volume of soil displaced. See below.



V1	=	$(1/3)\pi(D_1/2)^2 d_1$
V2	=	$(1/3)\pi(D_2/2)^2 d_2$
Voverlap	=	$(1/3)\pi(D_1/2)^2 d_2$

So,

V1	=	13.6	ft^3
V2	=	16.6	ft^3
Voverlap	=	2.2	ft^3

Ultimately,

V_{total}	**=**	***28.1***	***ft^3***

Convert volume to weight assuming a 90 lb/ft3 density for sand. Convert to tons, 2,000 lbs/ton.

V_{total}	**=**	***1.3***	***tons***

Determination of PM_{10} generated as a result of detonation,

	Alternative A	***Alternative B***	***Alternative C***
Detonations			
(per year)	100	50	10
Tons Displaced			
(per detonation)	1.3	1.3	1.3
PM10			
Emission Factor[1]	0.09	0.09	0.09
(pounds per pound)			
Emissions			
(tons per year)	***11.361***	***5.681***	***1.136***

Notes:
1 - Emission factors were obtained from a phone conversation with Mr. Tom Paxson at the Kern County Air Pollution Control District on August 30, 2004. Mr. Paxson provided guidance on estimating particulate emissions from weapons detonation. He indicated that PM_{10} emissions would be approximately equal to the silt content of the overburden and that the silt content of soil in that area is typically between 8% and 10%. Therefore, an average of 9% was used.

PM_{10} Emissions from Backfilling Using a Backhoe Loader

$E=0.45*(G^{1.5}/H^{1.4})*I*J$

Where,

E = PM_{10} Emissions from Dirt Pushing
G = Silt content of aggregate in percent
H = Moisture Content of the surface material
I = 2.2046; a conversion factor to convert kilograms per hour to pounds per hour
J = Hours of Pushing Operation

So if,

G = 7.5 %
H = 2.0 %
I = 2.2046 lbs/kg
J = 2.0 hrs, assume two hours of backfilling per detonation

Then,

E = 15.4 lbs/detonation PM_{10}

So, annual emission totals per alternative would be as follows,

	Alternative A	***Alternative B***	***Alternative C***
Detonations (per year)	100	50	10
Emissions (pounds per detonation)	15.4	15.4	15.4
Emissions (tons per year)	***0.772***	***0.386***	***0.077***

Notes:

Calculations based on methodology presented in the CEQA Air Quality Handbook, Prepared by South Coast Air Quality Management District, April 1993. Calculations are based on use of a bulldozer, expected to closely mimic those generated by use of a backhoe loader.

COMBUSTION OF TNT-TRINITROTOLUENE

$C_7H_5N_3O_6$

MW = 227.13 g/mol

The balanced chemical equation for the combustion reaction (spontaneous, in air) is

$2\ C_7H_5N_3O_6 \rightarrow 3\ N_{2(g)} + 7\ CO_{(g)} + 5H_2O_{(g)} + 7\ C_{(s)}$ (soot)

If you begin with 1 gram of TNT you will produce about 800 mL of the three gases at a temperature of 289 K, 1 atmosphere pressure. Below is a sample calculation:

1 g TNT (1 mole/227.13 g) = 0.004403 mole TNT.

0.004403 mole TNT (3 moleN_2/2 mole TNT)(28 g N_2/ 1 mole N_2) = 0.1849 g N_2

PV = nRT; so V (volume of gas) = nRT/P. R = .082058 L-atm/mol-K, P = 1 atm, T = 298 K (25 ^oC).
Volume Nitrogen gas = (0.1849 g N_2/28 g/mol)(.082058 L-atm./mol-K)(298 K)/1 atm = .161 Liters N_2

Volume CO gas = ..004403 mol TNT (7 mol CO/2 mol TNT)(28 g CO/mol CO) = 0.43149 g CO.
Volume CO gas = (0.43149 g CO/28 g/mol)(.082058 L-atm./mol-K)(298 K)/1 atm = 0.3768 Liters CO.

Volume of water vapor produced = .004403 mol TNT (5mol H_2O/2 mol TNT)(18 g H_2O/1mole H2O) = 0.198 g H_2O

Volume water = (this part is not accurate because the heat of reaction will make the water vaporize so I should use a gas density of water) = (0.198 g H_2O/18 g/mole)(.082058 L-atm/mol-K)(298 K)/1 atm = 0.2689 Liters H_2O

Adding the three volumes together:

1 g TNT procues 0.807 Liters of gas (806 mL). This is about an 800 times increase in volume.

B DISTRIBUTION LIST

APPENDIX B
DISTRIBUTION LIST

AFFTC Technical Library
412 TW/TSDL
Edwards AFB, CA 93524

Antelope Valley Air Pollution Control District
43201 Division St., Ste. 206
Lancaster, CA 93639-4409
Attn: Charles L. Fryxell. APCO
(Or) Bret Banks, Operations Manager

Bureau of Land Management
Barstow Area Office
2601 Barstow Road
Barstow, CA 92311-3221

Bureau of Land Management
Ridgecrest Area Office
300 S. Richmond Road
Ridgecrest, CA 93555-4436

California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

CALTRANS
Department of Transportation
District 9
500 South Main Street
Bishop, CA 93514

City of Lancaster
Planning Department
44933 N. Fern Ave.
Lancaster, CA 93534

City of Palmdale
Planning Department
38250 N. Sierra Highway
Palmdale, CA 93550-4798

Edwards AFB Base Library
95 SPTG/SVMG
5 West Yeager Blvd.
Building 2665
Edwards AFB, CA 93524-1295

Kern River Valley Library
7054 Lake Isabella Boulevard
Lake Isabella, CA 93240
Attn: Karen Leifeld, Branch Supervisor

Kern County Library
Wanda Kirk Branch (Rosamond)
3611 Rosamond Boulevard
Rosamond, CA 93560

Lahonton Regional Water Quality Control Board
15428 Civic Drive Suite 100
Victorville, CA 92392

Los Angeles County Library
Quartz Hill Branch
42018 N. 50th Street W.
Quartz Hill, CA 93536

Los Angeles County Library
Lake Los Angeles Branch,
16921 E. Avenue O, Suite A,
Palmdale, CA 93591

Muhammad Bari
Director of Public Works
HQ NTC Ft. Irwin
Attn: AFZJ-PW-EV
PO Box 105097
Building 285
Fort Irwin, CA 92310-5097

Mojave Desert AQMD
14306 Park Ave.
Victorville, CA 92392-2310
Attn: Charles L. Fryxell, APCO
Native American Heritage Commission
915 Capital Mall, Room 364
Sacramento, CA 95814

John O'gara
Head of Environmental Planning
Environmental Office
Code 8G0000D
#1 Administration Circle
Naval Air Weapons Station
China Lake, CA 93555

Office of Planning and Research
California State Clearinghouse
PO Box 3044
Sacramento, CA 95812-3044

Palmdale City Library
700 E. Palmdale Boulevard
Palmdale, CA 93550

San Bernardino County
Land Use Services Department
Planning Division
385 N. Arrowhead Ave., 1st Floor
San Bernardino, CA 92415-0182

US Department of the Interior
Fish and Wildlife Service
Ventura Field Office
2493 Portola Road, Suite B
Ventura, CA 93003-7726

US Department of the Interior
National Park Service
Death Valley National Park
PO Box 579
Death Valley, CA 92328

Environmental Protection Agency
Region IX
EIS Review Section
75 Hawthorne Street
San Francisco, CA 94105

Federal Aviation Administration
Western Pacific Region
Attn: Charles Lieber
Airspace Management Branch
15000 Aviation Boulevard
Lawndale, CA 90261

HQ AFMC/CEV
4225 Logistics Avenue, Suite 8
Wright Patterson AFB, OH 45433-5747

Kern County APCD
Attn: Thomas Paxson, P.E.
2700 M Street, Suite 302
Bakersfield, CA 93301-2370

Kern County Library
Boron Branch
26967 20 Mule Team road
Boron, CA 93516

Kern County
Department of Planning and Development Services
2700 M Street, Suite 100
Bakersfield, CA 93301-2323

Kern County Library
California City Branch
9507 California City Boulevard
California City, CA 93505

Kern County Library
Tehachapi Branch
450 West F Street
Tehachapi, CA 93561

Los Angeles County Library
Lancaster Branch
601 W. Lancaster Boulevard
Lancaster, CA 93534

Kern County Library
Mojave Branch
16916-1/2 Highway 14
Mojave, CA 93501

US Senator Diane Feinstein
525 Market Street, Suite 3670
San Francisco, CA 94105

US Senator Barbara Boxer
501 I Street, Suite 7-600
Sacramento CA 95814

Congressman McKeon
Antelope Valley Field Office
1008 W. Avenue M-14 #E-1
Palmdale, CA 93551

Office of Historic Preservation
State Historic Preservation Officer
PO Box 942896
Sacramento, CA 94296-0001

Angeles National Forest
Supervisor's Office
701 N. Santa Anita Ave.
Arcadia, CA 91006

USDA Forest Service
Regional Office R-5
1323 Club Drive
Vallejo, CA 94592

USDA Forest Service
Pacific Southwest Region
Sequoia National Forest
900 West Grand Avenue
Porterville, CA 93257

California Department of Parks and Recreation
P.O. Box 942896
Sacramento, CA 94296

Sierra Club
Antelope Valley Group
P.O. Box 901875
Palmdale, CA 93590

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C RESPONSE TO COMMENTS

APPENDIX C – RESPONSE TO COMMENTS

Response to Comments from the ARG

The following comments are provided:

1. Page 2-3, fig 2-1: Does not show the distances to the towns.

Response: The distances to the towns are in red on the dashed line leading to the town or adjacent to the town name.

2. Page 3-88, Line 25 should read ".....flood-of-record-level of ...."

Response: Will change to read -- flood-of-record-level….

3. Page 3-88, Line 26 says the flood-of-record-level was 2,277.4.
The table 3-17 shows the 50, 100, and 200 year levels above the flood-of-record-level. How can this be?

Response: This data in the table is quoted directly from the "Model EA" provided by 95 ABW/CEV, page 118/119. The 2,277,4 feet MSL flood-of-record-level is estimated. The point is that the development on Edwards AFB is physically located above the flooding level.

4. Page 3-27, Line 19 says that Surveys of the West Range of the PIRA, which includes the PB-13 target site area, have identified over 136 prehistoric and historic sites. However Page 4-15, Line 11, says that there are no known cultural resources or artifacts in the target area.

Response: This is a correct statement. The 136 prehistoric and historic sites are located in the West Range of the PIRA; however there are no known cultural resources at the PB-13 target (1,000 foot diameter circle).

5. Page 4-14, Line 12 says only 50% are expected fall within 1 mile.
Page 4-49, states that the weapons have improved in accuracy and the circular error was 400 ft in Vietnam.

Response: For the purpose of potential impact on cultural resources historic uses of the targets on the PIRA the circular error is based on the probability that the 50 percent of bombs that don't land on the target will be within the 1 mile radius. Will reword. The statement on page 4-49 reflects that we have improved on the historic circular error.

6. Page 4-20, Line 21 Missiles and rockets are armed munitions.

Response: This is true if the warhead contains NEW vice a spotting charge.

7. Page 4-41, Line 5 States that the proposed testing would have no effect on the groundwater supply. However P4-21 lines 11 states that the TNT residue moves rapidly through the soil (also what about the cumulative effect?). Line 15 states RDX and secondary products will move rapidly through the soils and into the ground water.

Response: Page 4-20, lines 27-30 state that if device functions as designed it results in complete combustion. If complete combustion (fully exploded ordnance) does not occur, the potential for movement of secondary products to the ground water could occur; but since the cleanup after each mission as indicated on page 4-21, lines 24 – 29, and the fact that target PB-13 is not located in an area where groundwater recharging occurs; impact would be less than significant.

8. Page 4-42, Line 13/14 says there is no date describing the ground water quality at the PIRA. What about the 3 water wells just to the North of the area and one less than one mile away at target 14.

Response: The data from 2 of the 3 wells referenced are 1.1 miles NNW of the target site up gradient of the target. Analytical data shows no significant contamination that would have resulted from the explosive residues. The third monitoring well 270-MW01 located 1.7 miles W of the PB-13 is down slope of the target site. As these wells are the closest to the target and no additional wells are specifically at the PB-13 target there is insufficient data to characterize the water quality at the target site. The statement in lines 13/14 will be changed to read: Currently there is no available data describing the water quality at PB-13, however analytical data on water quality obtained from monitoring wells up slope of the target site do not indicate that contamination from the use of explosives has affected the groundwater.

9. Page 4-47, Line 2 thru 4 states that there will be a cleanup of all range targets after each event. This should be changed to read that the cleanup will only involve removal of the duds. The remaining metals and residue will remain and could impact the environment.

Response: Lines 2-4 state that current management activities include routine inspection and cleanup of all range target sites. (No reference to after each event). The additional cleanup management procedure will be beneficial. Recommend statement remain as stated.

10. Page 4-48, Add to cumulative effects.

Geology and soils: What effect will the continued dropping of bombs have on the shattering/pulverizing of the rocks?

Wind blown soils: What will be the cumulative effect of wind blown soils/contaminates on the downwind plants?

Response: Add the following to Cumulative Effects:

4.15.2.2 Natural Resources

The cumulative effects of the wind blown soils and contaminates on plants in the target area would be considered less than significant. The immediate target area is devoid of plants, and the area outside the immediate target area is sparsely populated with plants. Plant species in this area are typical for the PIRA as well as the other parts of the Mojave Desert area. Naval Air Station China Lake (located in the Mojave Desert area) routinely uses its' target sites for detonation of NEW armed munitions. There are no records of direct impacts to plants or sensitive species resulting from the use of their targets and test sites. Because natural resources are similar and there are a large number of these plants scattered throughout the ranges combined with the lack of any

identified impacts, the use of the target site would have a less than significant impact on the plant species surrounding the target area.

4.15.2.3 Geology and Soils

The designation and use of the PB-13 target for armed munitions only integration testing would not result in a significant cumulative change in the geology and soils of the target area. The target area is graded soil classified as typically sandy loam and gravel. The gravel would undergo shattering/pulverizing and would generate fine sand and PM_{10} (approximately 11.36 tons per year based on 100 – 500 NEW detonations) as a result of the detonations. The soils at Edwards AFB are given an erosion hazard of slight to severe for wind erosion. Since the target site would be backfilled after each mission, the fines and silt would be mixed with the sandy loam and gravel, thus minimizing the potential effects of wind erosion on an open crater.

Response to Glenn Arola Comments

-----Original Message-----
From: Arola Glenn W Civ 412 MX/MXFP
Sent: Thursday, January 06, 2005 11:29 AM
To: Reinke Danny C Contr 95 ABW/EM
Cc: Bare Michelle P Contr 95 ABW/CEV
Subject: Comments to DEA Weapons delivery

I reviewed this EA were thoroughly and enjoyed it--another good job. Just have some questions and/or recommendations:

How did we come up with 100 tests for Alternative A? Is that a calculation off of some data?

Answer:

The 100 tests for Alternative A were identified and established by Steve Cronk, 412TW/ENRO.

What would the process entail for Edwards to become certified to handle armed munitions?

Answer:

EOD personnel are trained to handle armed munitions. Standard operating procedures would apply.

Chap 2, Line 7, the definition of NEW. I believe it is the first time this is mentioned, but it was not spelled out; it is in the glossary; may want to add it the first time it is used.

Answer:

The first occasion of NEW can be found on page 1-2.

Who will clear the targets of the duds after a test? Is it certified and trained munitions folks or someone else? Range personnel?

Answer:

Trained EOD personnel would be responsible for clearing the target (the only target is PB-13).

Toward the end of the document there are Munitions Integrated Tests to be performed in 2005 on. The first few years it lists 200. Does that conflict with Alternative A?

Answer:

A total of 100 missions are indicated for Alternative A. A single mission could have more than one aircraft involved. The number of sorties referred to would include the chase aircraft. Thus the 200 sorties are appropriate.

These were just a few thoughts or things to think about or list to make the EA flow a little easier. Any questions, please email or call!!!!!!!!!!!!!!!!!!!!!

Happy New Year

Glenn Arola